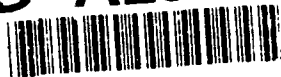


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ASSESSING COMBAT POWER:
A METHODOLOGY FOR
TACTICAL BATTLE STAFFS

A Monograph
by
Major Allen D. Raymond



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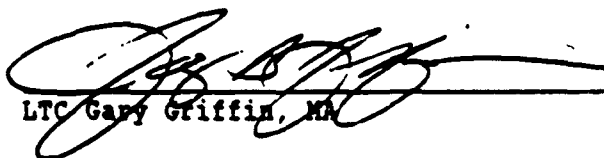
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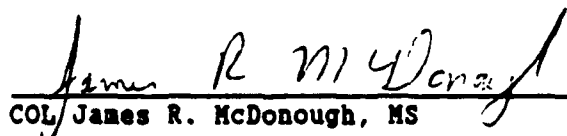
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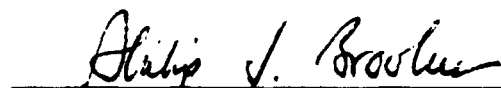
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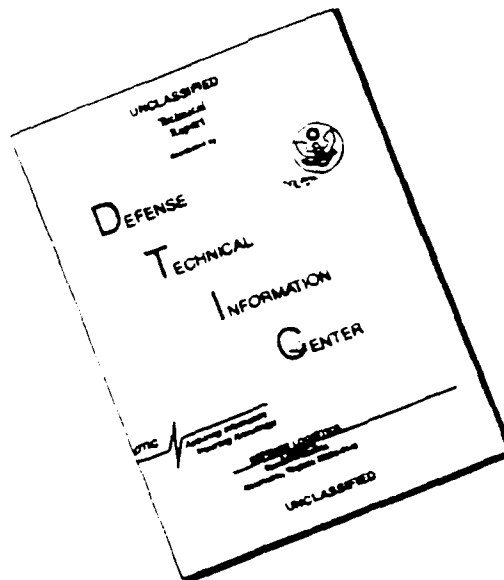

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ABSTRACT

"ASSESSING COMBAT POWER: A Methodology for Tactical Battle Staffs" by MAJ A. Dwight Raymond, USA, 77 pages.

This monograph presents a methodology to help tactical battle staffs estimate ground force combat power, and consists of three major products. First, pre-calculated "combat potential scores" (CPS) for different friendly and threat units are provided, so that staff officers can determine force ratios based upon the friendly task organization and the enemy order of battle. Second, the "weapon values" (WV) and "category weights" (CW) which were used to develop the CPS values are included. With these, staff officers can modify CPS values as desired and develop values for unique units. Finally, the study addresses ways to use the CPS values during planning (war gaming) and while monitoring tactical operations.

The methodology is a variation of the "Weapons Effectiveness Indices/Weighted Unit Value (WEI/WUV)" approach. It is a relatively simple static measurement of combat power, yet has sufficient detail to permit differentiation among units at the tactical level. It avoids the complexity of other, more dynamic approaches discussed in the monograph; conversely, it is more detailed than the overly-broad method currently taught at the US Army Command and General Staff College. It does not give a comprehensive measurement of combat power, but merely intends to provide a quantitative starting point to estimate relative force ratios.

The text provides an overview of the model and its applications, together with discussion of other models and the field in general. The two appendices are stand-alone sections with the requisite instructions and data for their usage; these are the only portions of the monograph necessary for its practical application.

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I. INTRODUCTION

Although Clausewitz wrote that the conduct of war is more of an art, he nevertheless conceded that certain aspects gives validity to the term "military science."¹ "Science" implies certain activities--such as testing propositions, prediction, explanation, and measurement--with the eventual development of empirically-based laws or maxims. Even the purest arts have certain "scientific" characteristics; one example is that red mixed with yellow creates orange, while another is the musical "chemistry" that creates chords out of a specific combination of individual notes.

However artful the military profession is, it has historically been closely linked to hard sciences such as engineering, ballistics, and physics. Indeed, it was not merely coincidental that the engineering centers of 19th century nations were also military institutions.² One might simplify the matter by the generalization that "military science" was associated with the preparation for war and such routine activities as movement, siegecraft and logistics. Fighting wars, however, was the essence of "military art," and required genius, *coup d'oeil*, or *virtu*.'

As war became more technical, its conduct in a sense became more systematic and, thus, more "scientific;" examples of this increasingly technical nature include the planning required for preparatory bombardments as well as Desert Storm's "integrated tasking order" that orchestrated the methodical destruction of Iraq's military capability. In addition, the modern fields of

computer science and operations research have facilitated the establishment of models and simulations that further break down the boundary between military art and military science.³ These models, in effect, seek to preview a conflict through the resolution of mathematical relationships, instead of relying upon the intuition of military commanders and staffs.

Whether one prefers to call war an "art" or "science," a key step in battle's preparation and management is the estimation of relative combat capability. Much of the literature suggests that combat capability can indeed be calculated, however roughly. In *The Causes of War*, Geoffrey Blainey states that war is "a dispute about measurement [of relative strength]; peace on the other hand marks a rough agreement about measurement."⁴ If both parties can agree on the relative strength, then battle would be essentially predictable and the weaker party would likely concede before the commencement of hostilities. Conflicts occur, however, because flawless prediction is impossible due to friction (chance) and the inherent difficulty in measuring combat power to begin with.

The estimation of combat capability is a problem common to all levels of conflict. At the strategic level, George Quester has identified "operations research error" (miscalculation) as one of the fundamental causes of war to begin with; in other words, nations have fought wars based upon the mistaken belief that they can be victorious.⁵ The problem is no less vexing at the operational and tactical levels, since these echelons actually plan and fight the engagements. No methodologies for estimating

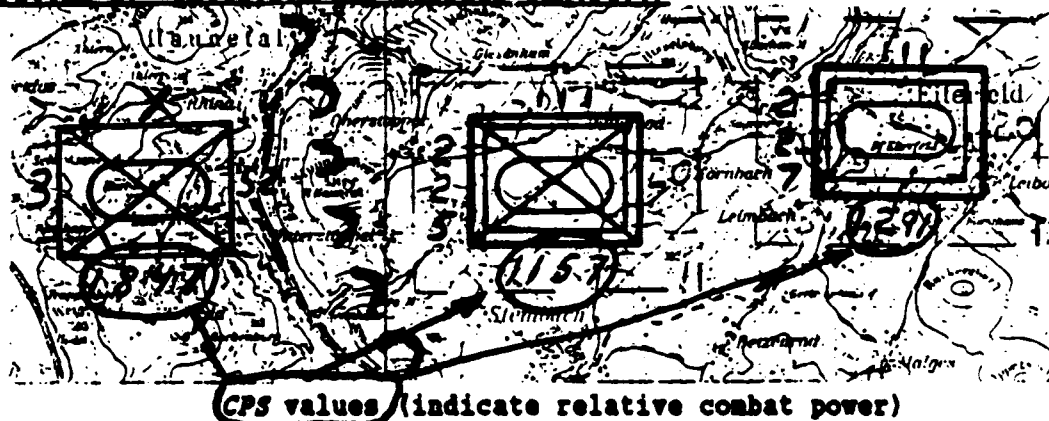
combat capability exist, however, that meet three necessary criteria for practical use, specifically: (1) sufficient detail to permit meaningful differentiation; (2) simplicity both for comprehension and utilization; and (3) adaptability to account for changes in force structures and weapons capabilities. The question is, what approach can portray relative combat strengths with reasonable accuracy, while remaining within the bounds of military staff capabilities?

This study will explain a methodology to assist tactical battle staffs in the estimation of combat potential. This ambition is tempered, however, by two important caveats. First, combat modeling must balance simplicity and detail. All modeling is in a sense simplistic, but to the extent that a methodology overlooks too many important nuances (such as qualitative differences between tanks) it will lack any useful realism. On the other hand, attempts to account for numerous dimensions can quickly create a cumbersome methodology that is difficult to understand or apply. Additionally, an attempt to replicate the friction and fog of combat (such as through random chance generators) could indeed cause plausible game situations that might not occur during an actual operation.⁶

This study will offer three products. First, contained in Appendix 1, are pre-calculated "combat potential scores" (CPS) for different units that battle staffs may need to account for in planning exercises or in actual operations. These CPS values indicate the relative overall combat power of units, and were

developed with the methodology explained in this study. With the CPS figures, staff officers can quickly generate displays to provide instantaneous appraisals of relative combat strengths. An example is the following portion of a situation map:

FIGURE 1: Situation Map Display (Extract)



Second, the methodology used to develop the CPS scores will be explained in order that the interested reader can reconstruct or alter the calculations, as necessary. Finally, this study will discuss ways in which battle staffs can use these figures when planning and monitoring operations.

In theory, battle is determined by the respective combat powers of A and B; the side with the greater combat power will win. In the broadest sense, combat power includes tangible and intangible aspects. Tangible elements comprise a large portion of combat power; these include the measurable numbers of troops, equipment, and supplies that the adversaries bring to battle. In the abstract, this is reflected by the following relationship:

$$CP_A <----> CP_B$$

in which CP represents the tangible combat power of force A or B.

Perfect algorithms are impossible, however, because intangible elements (such as levels of training, doctrine, leadership, morale, surprise, and fatigue) modify the combat power of the adversaries:

$$CP_A (IF_A) \langle \text{-----} \rangle CP_B (IF_B)$$

in which IF represents the net effect of the various intangible factors. If IF is greater than 1, then that side's combat power is effectively increased; if less than 1, then the combat power is degraded. Some parameters, incidently, are subject to dispute as to how tangible they actually are; these include qualitative differences in equipment, the types of terrain in which battle is conducted, and the methods of employment, particularly as regards whether one side secures a "defender's advantage" which can result in, according to some, a three-fold increase in combat power.⁷

However influential the intangible factors are (and it is quite possible that these are ultimately more determinative than the tangible elements) assessments of combat power inevitably begin with comparisons of the tangible factors. At the brigade, division, and corps levels, an important task for battle staffs is the estimation of relative combat power. This is necessary to war game possible courses of action, to develop branch plans, and to monitor battle status during operations.

II. CONTEMPORARY COMBAT POWER MODELS

Military modeling is much like training, drills, tactical exercises, and other activities in that it serves as a low-cost substitute for actual combat. As such, it is not a new

phenomenon. Assessments such as Napoleon's "the moral is to the physical as three is to one" are in effect attempts to estimate the relative importance of different parameters and to place them on a common scale. Sun Tzu maneuvered courtesans, in lieu of troops, to simulate military activities; in the nineteenth century, military academies and general staffs in Europe conducted their own simulations.⁸ Hundreds of models currently exist;⁹ however, one of the earliest, and time-honored, approaches was Frederick William Lanchester's 1916 work *Aircraft in Warfare*, which modeled battlefield attrition. His "Lanchester Equations" are still used in dynamic modeling, and consisted of two general equations that related opposing force levels, destructive capabilities, attrition, and time.¹⁰

TABLE 1: Lanchester Family Equations

$$\frac{dR}{dt} = -bAaB \qquad \frac{dB}{dt} = -rAaA$$

$R(t), B(t)$ = lethalties of Red and Blue Forces at time t .
 r, b = effectiveness of units (e.g., .25 is 25% effective)
 a, A, a, A = constant coefficients ("sometimes interpreted as overall damage probabilities per day.")¹¹

These equations simply state that the change in forces R and B over time (in other words, the attrition) will be determined by the initial combat strengths of both sides, their respective destructive capabilities, and certain factors that modify the strength of the combatants.

The two family equations can be integrated and combined to form a generalized "state equation," into which values from 0 to 1 inclusive may be inserted for the constant coefficients. This process generates the four "state equations" in Table 2, of which the Square Law is probably the most widely used.

TABLE 2: Lanchester State Equations^{1,2}

Square Law	$M(M0)^2 - M^2 = k(M0^2 - M^2)$
Linear Law	$M(M0) - M = k(M0 - M)$
Logarithmic variant	$\ln[M(M0)/M] = k[\ln(M0)/M]$
Amush variant	$M^2(M0)^2 - M^2 = k(M0 - M)$

A more recent approach is Trevor Depuy's Quantitative Judgement Method of Analysis, which is overwhelming in its detail, though less so in its rigor.¹³ First, he developed a "theoretical lethality index" (*TLI*) for different weapons systems based upon the number of casualties the systems could inflict in a target-rich laboratory. For example, ancient cutting and thrusting weapons were assigned a *TLI* of 23, while a World War II medium tank was given a score of 935,458.¹⁴ Second, through an analysis of World War II and Arab-Israeli battles, he developed values for such factors as terrain, weather, leadership, morale, and logistics. Using historical cases, he generated modified forms of the *TLIs* (called Operational Lethality Indices, or *OLIs*), applied the appropriate factors discussed above, and then developed unit Combat Power Potential values that were used to predict the battle's outcome. This was then compared with the actual outcome, which was a function of mission success, casualties, and space gained or lost.¹⁵

Some "static" models are less ambitious in design, and attempt to portray a snapshot, rather than a "dynamic" evolution. Until recently, in ST 100-9 *The Command Estimate* the US Army's Command and General Staff College advanced a simple static

approach to estimate combat ratios at the tactical level. This system relied upon two types of values; the first was for maneuver units and was couched in terms of a force's combat power relative to a Soviet BTR battalion, and the second was for fire support units. Scores used in this methodology are shown in Table 3.¹⁶

TABLE 3: 1989 CGSC Combat Unit Comparison Values

US (J Series)		<u>MANEUVER</u>		Soviet			
M113 Bn	= 1.5			BTR Bn		= 1.0	
M2 Bn	= 2.0			BRP Bn		= 1.5	
M1 Bn	= 3.0						
M1A1 Bn	= 3.15	Tk Bn	ITZ	TR	ITD		MR
M60A3 Bn	= 2.25	T-80	2.42	1.56	2.00		2.00
ACR Sqdn	= 2.75	T-64	2.23	1.44	1.86		1.86
Div Cav Sqdn	= 1.5	T-72	1.86	1.20	1.55		1.55
Div Cav Sqdn (H)	= 2.0	T-62	1.24	.80	1.00		1.00
		T-55	1.00	.64	.83		.83
Atk Hel Bn (AH-64)	= 4			AT Bn = 1			
Atk Hel Bn (AH-1)	= 3			Atk Hel Sqdn = 2			
		<u>ARTILLERY</u>					
FA Bn	= 2			FA Bn = 2			
HLRS Btry	= 2			HLR Btry = 1			

The 1991 version of ST 100-9, *Techniques and Procedures for Tactical Decisionmaking*, contained an even more simplistic war-gaming approach which settled for a rougher approximation, arguing that "more numerical precision . . . would be problematical."¹⁷ It merely considered all regiment and brigade units, (regardless of type, composition, or numbers of subordinate battalions) as equal.

There are several reasons why the above methods are ill-suited for use by tactical battle staffs, and the problems reflect

the tension between the twin modeling criteria of simplicity and detail. The 1916 Lanchester Equations can only provide an abstract value in dynamic application; the revolutionary changes in weapons systems since the publication of his book would obviously make any of Lanchester's static pretensions hopelessly obsolete. Other similar approaches, such as Joshua Epstein's "Adaptive Model of War," may be theoretically valid, but they tend to have equations comprised of variables which must somehow be replaced by numerical values before they can have practical use (the variables r , b , c_1 , c_2 , c_3 , and c_4 in Table 1 illustrate this problem).¹⁸ Additionally, some claim that the validity of the Lanchester equations is suspect, both theoretically and empirically. Epstein, for example, claims that the equations attempt to predict combat losses, yet do not account for any withdrawal activity (in terms of intentions and rates) by the defender. Additionally, he argues that the "square law" generates unlikely relationships. For example, a force outnumbered by three-to-one would need to be nine times as effective in order to achieve parity in combat. This, argues Epstein, is both intuitively incorrect and historically unsupported.¹⁹

Other reservations about the Lanchester models include skepticism about determining the "combat effectiveness values" as well as the constant coefficients, particularly as regards the apparently arbitrary limitation of the latter values to either "0" or "1". Even assuming the reliability of these equations, they are more suited for the purposes of dynamic, complex war gaming,

rather than for efficient staff procedures.

Similarly, Dupuy's Quantitative Judgement Method of Analysis is an overly-detailed approach that would strain both the time and the inclinations of most tactical battle staffs. There are also at least three other reasons to question Dupuy's methodology. First, the QJMA is comprised of over seventy independent variables that were derived from a sample of approximately sixty cases. Aside from technical issues such as how precisely these independent variables were measured, and how these test cases were selected, most statisticians would be suspect of any inferences drawn from such a small data set.

Second, one must question how applicable to modern warfare the QJMA's World War II sample can be. Dupuy claims that his model accurately predicted the results of several Arab-Israeli engagements, but this was done retroactively, and by parties that had a strong interest in demonstrating that the model was useful. Moreover, to claim that the model is "accurate" by Dupuy's standards, the user must only ensure that the victor's Combat Power Potential is greater than the loser's. The model becomes tautological; with over seventy modifying variables to choose from, it is a relatively easy task to pile on selected additional factors until the desired ratio is achieved. Indeed, Dupuy's iterative process encourages such manipulation.²⁰ It is worth noting that Dupuy's only known *a priori* estimate (before Operation Desert Storm) was not especially prescient. He predicted between 5,729 and 8,929 US casualties, between 2,794 and 4,133 allied

casualties, and Iraqi casualties of approximately 100,000.²¹

Third, examination of Dupuy's Operational Lethality Index (*OLI*) scores reveals some debatable relationships. On his scale, a 60mm mortar (*OLI* = 21.00) is "worth" nearly eight M-113's (*OLI* = 2.69). Although it is equipped with an excellent thermal sight, according to Dupuy an M-60A3 (643) is only 3% better than an M-60A1 (622), while being inferior to a T-62 (691). An M-2 Bradley (534) is worth more than an MLRS (511), while a T-72 (977) is worth nearly four AH-64 Apaches (256). Finally, he implies that an M-1A1 tank (1,049) and an F-16 (1,359) are fairly comparable.²²

The static CGSC approaches avoid the complications of the Lanchester and Dupuy models. They are, however, too simplistic; moreover, the origin of the assigned values is not explained. The latest approach equates US brigades (of unspecified size and type) with Soviet regiments; this is too rough an approximation for most staff work. The earlier methodology is perhaps suitable if one is accounting for pure battalions of the type included in Table 3, but additional work is needed to account for task organization and for other units not reflected. Along these lines, the methodology is mathematically sound only as long as TO&Es do not change. Additionally, the generation of two types of scores (for maneuver units and fire support units) is an unnecessary complication if one accepts the proposition that combat power includes aspects of both maneuver and firepower, as well as other characteristics.

To incorporate both simplicity and detail, a more fruitful approach is a variation of the *WEI/WUV* methodology developed by

the US Army Concepts Analysis Agency in the early 1970s. In this approach, weapons were divided into categories (e.g., tanks, artillery pieces, mortars, etc.) and each category was assigned a category weight indicative of its value relative to other categories. Within a given category, weapons were assigned a Weapon Effectiveness Index (WEI) to reflect its value relative to other weapons in the same category. By multiplying

Quantity x Weapon Effectiveness Index x Category Weight for each weapon type in a unit, and adding the products, a Weighted Unit Value (WUV) was generated, which then could be compared with other units.²³

TABLE 4: Sample WEI/WUV Calculation (Hypothetical Unit)

WEAPON	QUANTITY	x	WEAPON EFFECTIVENESS INDEX (WEI)	x	CATEGORY WEIGHT	=	SUB-TOTAL
M-48A5 Tank	20	x	.90	x	59.5	=	1,071
M-113 APC	30	x	1.00	x	9.5	=	285
M-198 155mm How	6	x	.80	x	78.5	=	377
WEIGHTED UNIT VALUE (WUV) =							1,733

There have been many variations to the basic WEI/WUV methodology. Typically, a unit's WUV was divided by the WUV for a baseline unit (the US 1st Armored Division was normally used) to create "Armored Division Equivalent" (ADE) values; a later modification used a notional "NATO Composite Division" value to generate "Division Equivalent Firepower" (DEF) scores.²⁴

In order to fine-tune the methodology, an early application developed both offensive and defensive scores for units. This was

modified still further by the inclusion of terrain as a factor; a given unit would thus have six scores, based upon whether it was considered in an offensive or defensive role, and depending upon its theater of operations.

Conversely, other modifications have attempted to simplify the *WEI/WUV* methodology. The *DEF* variant, for example, omitted some weapons categories, to include small arms, from its calculations. Consequently, it was not able to account for infantry units in its aggregation. Additionally, it considered as equal weapons systems in the same generation (e.g., Chieftains, Leopard Is, and M-60s were all scored equally).²⁵

Although many analysts such as Mearsheimer, Epstein, and William Mako have used *WEI/WUV*, *ADEs*, or *DEPs*,²⁶ many problems exist with the basic approach. By itself, it ignores most of the intangible factors (such as training and leadership) addressed earlier, not to mention the tangible effects of airpower, engineer capability, electronic warfare, and other battlefield systems. Additionally, it assumes away the fact that the combat value of any system is not fixed, but depends upon the situation (*METT-T*). The reader should indeed be skeptical about any attempt to quantify something as complex, changeable, and intangible as combat power. The figures presented in this paper should be considered indicative, not predictive, and the reader is encouraged to modify, alter, or temper them as necessary.

Despite the inherent problems of this type of methodology, a roughly accurate quantitative scale can be useful to help staff

officers plan and monitor tactical operations. Much as the "tale of the tape" is used to assess boxers before the fight, the scale presented here can help measure relative combat potential.

III. THE MODEL EXPLAINED

This paper uses an adaptation of the *WEI/WUV* methodology to achieve a suitable blend of simplicity and detail for staff planning. This effort is an application of an earlier study for the Office of the Secretary of Defense Program Analysis and Evaluation, which resulted in a revised set of category weights that will be utilized here.²⁷ In an adaptation of the Delphi technique,²⁸ the previous study was based upon a survey administered to 109 NATO field grade officers to obtain their collective judgment of the relative worths of different categories of weapons systems in rolling, desert, and mountainous terrain. The respondents, given hypothetical situations which placed them as the commander of a combined arms company team, were asked to assess the relative value of different kinds of weapons systems in terms of tanks (e.g., a respondent would indicate that a tank was worth, say, three mortars in rolling terrain). Another portion of the survey asked the respondent to judge the effectiveness of weapons systems in rolling, mountainous, desert, urban, and forested terrain in both offensive and defensive scenarios. Analysis of the results shows that terrain generally has the same proportional effect on a system regardless of whether it is in the offense or defense (see Table 5). For the purposes of war gaming, this indicates that a weapon system could have a certain score for

a given terrain type, which could be modified by a constant factor whenever it is in a defensive posture.

TABLE 5: Survey Results (Mean Responses)²⁹

PART I. Tank: System Exchange Rates (Mean Responses)

	<u>Rolling</u>	<u>Forested</u>	<u>Mountainous</u>
Tanks : IFVs	1 Tk = 2.49 IFVs	1.48 Tks = 1 IFV	1.61 Tks = 1 IFV
Tanks : APCs	1 Tk = 3.63 APCs	1 Tk = 1.06 APC	1.18 Tks = 1 APC
Tanks : Mortars	1 Tk = 3.49 Mtrs	1 Tk = 1.10 Mtr	1.82 Tks = 1 Mtr
Tanks : Artillery	1 Tk = 2.42 Arty	1.57 Tks = 1 Arty	2.28 Tks = 1 Arty
Tanks : MLRS	1.35 Tks = 1 MLRS	2.28 Tks = 1 MLRS	3.00 Tks = 1 MLRS
Tanks : Atk Boles	1.67 Tks = 1 AB	2.20 Tks = 1 AB	3.82 Tks = 1 AB
Tanks : AT Wps	1 Tk = 2.05 ATVs	1 Tk = 1.80 ATVs	1.37 Tks = 1 ATV
Tanks : Inf Plts	1 Tk = 1.76 Plts	2.62 Tks = 1 Plt	3.37 Tks = 1 Plt
Tanks : Arm Rec Vehs	1 Tk = 3.39 ARVs	1 Tk = 1.61 ARVs	1 Tk = 1.14 ARV

NOTE: The above information should be interpreted as follows: "In rolling terrain, the collective assessment (mean response) of the survey's respondents is that a tank is equal to 2.49 infantry fighting vehicles, in terms of overall combat power."

PART II. System degradation by terrain type (Mean responses)

		<u>Rolling</u>	<u>Forested</u>	<u>Mountainous</u>	<u>Urban</u>	<u>Desert</u>
<u>TANK</u>	Offense	97.7	48.9	37.1	36.1	80.9
	Defense	97.7	54.2	44.6	41.9	78.9
	Combined	97.7	51.6	40.9	39.0	79.9
	Normalized	100.0	53.0	42.0	40.0	82.0
<u>INF</u>	Offense	98.9	58.3	40.9	46.1	71.7
	Defense	97.3	65.5	52.7	54.0	69.7
	Combined	98.1	61.9	46.8	50.1	70.7
	Normalized	100.0	63.0	48.0	51.0	72.0
<u>APC</u>	Offense	97.0	59.8	38.9	45.6	69.0
	Defense	93.3	70.7	53.9	56.8	64.8
	Combined	95.2	65.3	46.4	51.2	56.9
	Normalized	100.0	69.0	49.0	54.0	70.0
<u>MORTAR</u>	Offense	89.2	75.5	70.2	63.7	67.7
	Defense	91.3	76.8	72.5	66.5	67.4
	Combined	90.3	76.2	71.4	65.1	67.6
	Normalized	100.0	84.0	79.0	72.0	75.0

CONTINUED

PART II. System degradation by terrain type (Mean responses) (continued)

ARTY	Offense	96.7	62.8	52.9	47.3	74.5
	Defense	97.2	66.1	56.2	50.4	73.5
	Combined	97.0	64.5	54.6	48.9	74.0
	Normalized	100.0	67.0	56.0	50.0	76.0
ATK HELICO	Offense	97.0	67.7	69.4	46.8	77.6
	Defense	97.1	69.8	71.4	49.7	76.0
	Combined	97.1	68.9	70.4	48.3	76.8
	Normalized	100.0	71.0	73.0	50.0	79.0
ARTY TANK FPV	Offense	94.9	53.4	53.6	40.3	82.5
	Defense	95.4	58.6	57.4	44.9	81.6
	Combined	95.2	56.0	55.5	42.6	82.1
	Normalized	100.0	59.0	58.0	45.0	86.0
INF PLT	Offense	80.6	85.7	71.2	84.5	50.2
	Defense	80.4	86.0	73.9	85.3	51.9
	Combined	80.5	85.9	72.6	84.9	51.1
	Normalized	94.0	100.0	85.0	99.0	60.0
Infantry VTB	Offense	98.0	60.2	45.5	45.9	77.4
	Defense	96.7	64.9	50.4	48.8	75.4
	Combined	97.4	62.6	48.0	47.4	76.4
	Normalized	100.0	64.0	49.0	49.0	78.0

NOTE: The above information is interpreted as follows: "In forested terrain, in an offensive role, the collective assessment of the respondents is that a tank is 48.9% as effective as it is when employed in its optimum terrain." The "combined" scores are the averages of the "offensive" and "defensive" values. These combined scores were then normalized so that each system can be assigned an optimum terrain category which is rated at 100%.

The mean responses from the first section were then used to develop new category weights for rolling, desert, and mountainous terrain. Developing ratios between these values and the values from the second section, new category weights were also developed for urban and forested terrain. The combination of these two approaches yielded the "category weights" (CW) in Table 6, after tanks in rolling terrain (the "currency") were assigned 10.00 as a standard value.

TABLE 6: Category Weights³⁰

<u>CATEGORY</u>	<u>TERRAIN TYPE</u>				
	Rolling	Desert	Mountain	Urban	Forested
Tank	10.00	8.20	4.20	4.00	5.29
Inf Fty Veh ¹	4.02	2.89	6.77	6.35	7.83
Arm Per Carr ²	2.76	1.95	4.96	3.87	4.99
Artillery	2.86	2.15	7.64	4.12	4.80
MLRS	4.13	3.14	9.58	6.22	8.31
Atk Helo	13.50	10.27	12.60	9.01	12.06
AT Weapon	16.71	13.19	16.04	8.24	11.64
Inf Platoon	4.96	4.42	5.76	2.18	2.85
Arm Recon Veh	5.68	3.63	14.16	13.71	13.85
	2.96	2.30	3.68	2.52	3.29

NOTE 1: Vehicular systems include the entire crew, to include the squads carried in infantry fighting vehicles and armored personnel carriers.

The tables in Appendix 2 contain Weapon Value (WV) scores for most of the modern weapons systems found in friendly and threat inventories. Using the NEI/WUV methodology to assess a unit's combat potential, the quantity, category weight, and weapon value are multiplied together to yield a sub-total, and the subtotals for all weapons systems in the unit are added to provide that unit's Combat Potential Score (CPS). For example, the CPS for a mechanized infantry battalion task force (two mechanized companies and two tank companies) in rolling terrain is depicted in Table 7.

TABLE 7: Sample CPS Calculation (Balanced Mech Inf Bn Task Force)*

<u>SYSTEM</u>	<u>QUANTITY</u>	<u>x</u>	<u>WV VALUE</u>	<u>x</u>	<u>CAT WV</u>	<u>=</u>	<u>SUBTOTAL</u>
M-1 Tanks	28	x	1.50	x	10.00	=	420
M-2 Bradleys	28	x	1.30	x	4.02	=	146
M-3 Bradleys	6	x	1.30	x	2.96	=	23
M-901 ITV	12	x	1.15	x	4.96	=	68
4.2" Mortars	6	x	1.10	x	2.86	=	19
M-113 APCs	11	x	.50	x	2.76	=	<u>15</u>

CPS = 691

NOTE x: Both tank companies have 14 tanks (28 total). There are 13 M-2 Bradleys in each Mech company, with two in the battalion headquarters. E Company has 12 M-901 ITVs, and there are 6 M-3 CPVs in the Scout Platoon, as well as 6 4.2" mortars in the heavy mortar platoon. The M-113s are all "administrative," and consequently receive a reduced WV score (M-113 ambulances are not counted). Although the M-2 and M-3 are essentially the same weapon system, they perform different roles; this is reflected in the different category weights which were determined by the collective opinions of the NATO officers surveyed in the earlier study. Additionally, the M-2's combat potential reflects the capabilities of its organic infantrymen. Note that the above WV scores cannot be compared with each other; they only have meaning when compared with the WVs of other weapons in the same category (see Appendix 2).

The reader can use the *CWs* from Table 6 and the *WVs* from Appendix 2 to generate Combat Potential Scores for any unit, as long as the numbers and types of weapons systems are known. Appendix 1, however, contains pre-calculated *CPS* values for selected US, Soviet, NATO, Iraqi, North Korean, and South Korean units. (The balanced mechanized task force *CPS* entry in Table A-1 (page 38) is 693; this is different from the above value of 691 because of rounding.) *CPS* values can thus be determined for any desired level of aggregation, and a reasonably clear picture of relative combat strength can be generated. For example, assume that the 52nd Mechanized Infantry Division has been ordered to attack in a zone defended by depleted elements of the 28th Combined Arms Army, and that the division has the task

organization shown in Table 8.

TABLE 8: 52nd Infantry Division (M) (Selected Task Organization)

	<u>CPS</u>		<u>CPS</u>
1st Bde/21st Inf Div (Lt)	(340)	52nd Avn Bde	(993)
2-66 Inf	96	151 AB (AM-1)	301
2-67 Inf	96	152 AB (AM-1)	301
2-68 Inf	96	110 AB (AM-64) (OPCON)	391
2-45 PA (105 T) (DS)	52		
1st Bde	(2,428)	67th PA Bde (OPCON)	(170)
1-77 Mech (2H, 1T, 1AT)	483	2-611 PA (203)	85
1-2 Ar (3T, 1H)	781	2-612 PA (203)	85
1-3 Ar (4T, 1H)	991	A/43 PA (MLRS) (GS)	(152)
1-40 PA (155 SP) (DS)	99		(1,120)
2-641 PA (155 SP): R 1-40 PA	74	Div Troops	193*
A/1-441 ADA (DS)		TF 1-80 Mech (TCF) (4H, 1T, 1AT)	621
A/52d Engr (DS)		1-23 Cav	306
1st PSD (DS)		1-441 ADA (-)	
2nd Bde	(1,917)	52d Cal Co (-)	
1-78 Mech (3H, 1T, 1AT)	552	52d Engr (-)	
1-79 Mech (3H, 1T, 1AT)	552	52d MI (CENT)	
1-4 Ar (2T, 2H)	640	52d MP Co (-)	
1-41 PA (155 SP) (DS)	99	52d Sig	
2-642 PA (155 SP): R 1-41 PA	74	DISCON (-)	
B/1-441 ADA (DS)			
B/52d Engr (DS)			
2nd PSD (DS)			
3rd Bde	(2,218)		
1-81 Mech (2H, 2T, 1AT)	693		
1-5 Ar (2T, 1H)	571		
1-25 Ar (3T, 1H)	781		
1-42 PA (155 SP) (DS)	99		
2-643 PA (155 SP): R 1-42 PA	74		
C/1-441 ADA (DS)			
C/52d Engr (DS)			
3rd PSD (DS)			
(TF 1-80 Mech is Div TCF)			

*Accounts for U-113s not included under Bde units. From Table A-1, the value for a "division base" is 193.

TOTAL 52d MECH CPS = 9,338

The G-2 has assessed the enemy order of battle, and has estimated the effectiveness (in terms of percent) of the remaining units. This information is shown in Table 9.

TABLE 9: 28th Combined Arms Army (Division 89 Structure)

(After reorganization of army remnants)

	<u>Original Strength</u>	<u>Percent Effective</u>	<u>Current Strength</u>		<u>Original Strength</u>	<u>Percent Effective</u>	<u>Current Strength</u>
11 HRD (Y-64).....(4,881).....			(602) (12%)	7 GTD (Y-80).....(6,139).....			(1,888)
233 HRR (DTR)	942	30%	283	240 GTR	1,681	50%	841
237 HRR (DHP)	1,157	20%	231	242 GTR	1,681	40%	672
2/204 Arty Regt	71	30%	21	243 GHR (DHP)	1,219	25%	305
11 AT Bn	79	75%	59	249 GHR (DHP)	1,219	25%	305
11 Recon Bn	84	10%	8	1/207 Arty Regt	71	50%	36
				7 Recon Bn	84	40%	34
20 HRD (Y-64).....(4,881).....			(782) (16%)				
225 GHR (DHP)	1,157	35%	405	12 Indep AAA/BT Bn.....(102).....		80%	(82)
227 GTR	1,291	20%	258	37 Arty Bde.....(387).....			(66) (17%)
1/201 Arty Regt	71	40%	28	1 Gun Bn (B-20)	79	40%	32
201 HRL Bn (DH-21)	182	50%	91	4 Gun Bn (2A36)	114	30%	34
				75 RL Regt (DH-21).....(547).....		30%	(164)
27 GHRD (Y-64).....(4,881).....			(1,116) (23%)	27 AT Regt.....(237).....		90%	(213)
210 GHR (DTR)	942	30%	283	42 SSN Bde (SCUD).....(243).....		20%	(49)
212 GHR (DTR)	942	10%	94	44 SAN Bde		40%	
214 GHR (DHP)	1,157	50%	579	6 AN Regt.....(986).....		15%	(148)
199 Arty Regt	418	30%	125				
199 HRL Bn (DH-21)	182	15%	27				
21 Recon Bn	84	10%	8				

TOTAL 28th CAA CPS = 23,284 (Original)

TOTAL 28th CAA CPS = 5,110 (Current) (22%)

The numbers to the right of the units reflect their respective CPS values, and the 28th CAA table also lists current CPS figures after attrition has been accounted for. The G-2's percentage effectiveness values were translated into the revised CPS entries; these were then used to calculate current CPS values for the divisions, as well as an estimate of the percent effectiveness of these units. The "rolling terrain" values were used in this case, and for simplicity the reader may choose to use these values in all instances; however, values for other terrain are also included in Appendix 1. Total CPS for the 52nd

Mechanized Division is 9,338 while the 28th CAA is rated at 5,110 (or 22% strength overall).

Although it may be compounded by the intangible effects of the destruction experienced by the 28th CAA thus far, the overall force ratio is 1.8-to-1 in favor of the 52nd Mech. Perhaps even more important, the detailed breakdown of *CPS* values is useful for particularized comparisons. For example, if 1st and 2nd Brigades, together with the GSR artillery, were massed against the depleted 11th MRD, the ratio would be 4,345-to-602 (or 7.2-to-1).

It should be quickly noticed that some assets (notably air defense, engineer, CSS organizations and fixed wing aircraft) do not receive a *CPS*. This is due to the particular difficulty the original survey respondents would have had in assigning values based upon the scale used in the methodology. When using the approach presented in this study, these and other "intangible" elements of combat power must not be ignored, any more than maneuver fire support and maneuver should be focused upon to the exclusion of the other battlefield operating systems. In other words, *CPS* scores should not be taken out of the context that is shaped by these elements.

IV. WAR GAMING

The information presented in Tables 8 and 9 has additional uses, as well. For example, as the staff conducts war games during the operation's planning phase, the above information can be used as screening criteria to determine if proposed courses of action would result in necessary force ratios in selected areas.

Staffs should use two methods to facilitate the process. The first step is to list the friendly and enemy orders of battle, accounting for all units. A suitable format is that used to portray the 28th CAA in Table 9. This is done for a US unit in the following example.

TABLE 10: Order of Battle (Extract)

<u>UNIT</u>	<u>ORIGINAL STRENGTH</u>	<u>% EFFECTIVE</u>	<u>CURRENT STRENGTH</u>
1st Bde	(2354)	(87%)	(2,059)
TF 2-91 Mech (2H.1P)	483	80%	386
TF 2-10 Ar (3P.1H)	781	95%	742
TF 2-11 Ar (4P.1H)	991	85%	842
2-50 FA (BS)	99	90%	89

NOTE: Authorized strength, but modified based upon current task organization.

The list should be made easily changeable, to account for alterations in task organization as well as strength report updates. The same information can be displayed graphically by developing a "status chart" similar to the one in Appendix 1 (see page 36 and the discussion below). During the staff war gaming process, additional columns can be added to reflect, for example, projected strengths at the end of different operational phases.

In addition to the unit list or status chart, staffs can post moveable unit icons on operations maps, and indicate the appropriate CPSs. These can be locally fabricated by printing red and blue unit symbols on sheets of clear plastic; the individual unit symbols can be cut out and affixed to overlays with double-sided cellophane tape. These icons are superior to paper symbols because, in addition to being movable, they are more durable and

permit the reading of map features beneath their map positions. A example of this type of display is shown in Appendix 1 (page 35.)

Together, these two products can be quite effective during the staff planning process to provide rapid estimates of relative combat power as alternative courses of action are explored. They are merely essential tools for the actual war game itself, however;³¹ the actual resolution of hypothetical engagements is perhaps the most difficult aspect of war gaming.

Broadly speaking, four different methods are available.³² First, ambitious staffs may elect to use the Lanchester, Dupuy, or Epstein attrition models, with the appropriate *CPS* values. This, however, will necessitate several mathematical calculations as well as an estimate of the constant coefficients to be used in the equations.

A second approach is an adaptation of rules used in commercial wargames, and there are several variants to this technique. For example, a range of possible outcomes (such as a "most likely" case, a "highly successful" case, and a "highly unsuccessful" case) could be established and resolved using a means (such as a dice roll) to select between the probabilities. In addition to the simplistic limitation of three possible outcomes, the main disadvantage of this method is that a low-probability outcome could occur during the war-game, but would not necessarily be repeated during an actual operation. This method, however, can be an effective way of systematically developing branches and sequels, even if the resolution ultimately assumes

the most likely outcome at each critical event. Another obvious variant to the commercial war game technique is to establish a table with probabilistic outcomes and the ability to allow for combat modifiers, such as terrain and strongpointed positions.³³ This can most easily be done by adapting the rules from an appropriate war game.

A third approach is far simpler, though less realistic, and merely assumes a constant exchange rate in terms of attrition. For simplicity, a 3:1 exchange rate in favor of the defender is often used; this, however, is based upon several assumptions that may not be valid, not the least of which is that the specific conditions must logically support this rate.³⁴ Moreover, a judgment is required as to what level of attrition a defender is likely or willing to sustain. Another variation is to estimate loss rates based upon a doctrinal or historical source.³⁵ A slightly more flexible relationship would be as follows:

TABLE 11: War Game Resolution

Equation:
$$\text{Loss}_{\text{Att}} = (9) (n) (\text{Loss}_{\text{Def}}) \frac{(\text{CPA}_{\text{Def}})}{(\text{CPA}_{\text{Att}})}$$

Loss_{Att} = Attacker's Attrition

Loss_{Def} = Defender's Attrition

CPA_{Def} = Defender's Combat Potential Score

CPA_{Att} = Attacker's Combat Potential Score

n = Modifier(s): (greater than one favors defender; less than one favors attacker)

Example 1:

let $\text{CPA}_{\text{Def}} = 100$

$\text{CPA}_{\text{Att}} = 300$

$n = 0$ (no modification)

assume 30% loss rate to the defender--then $\text{Loss}_{\text{Def}} = 30$

$$\text{Loss}_{\text{Att}} = \frac{(9)(30)(100)}{(300)} = 90 \text{ (30\% of original strength)}$$

TABLE 11: War Game Resolution (continued)

Example 2: If the attacker has a CPS of 500 (5:1 combat power ratio), then

$$\text{Loss}_{\text{att}} = \frac{(9)(30)(100)}{(500)} = 54 \text{ (11\% of original strength)}$$

Example 3: If the attacker has air superiority, superior training, and the element of surprise, while the enemy is exhausted and has been cut off from its supply lines (attacker's CPS is 300), then:

1. Let m = a series; [.75 for each of the five dimensions identified = $(.75)^5 = .237$]

2. $\text{Loss}_{\text{att}} = \frac{(9)(.237)(30)(100)}{(300)} = 21 \text{ (7\% of original strength)}$

In the above equations, the term " $(9m)$ " permits adjustment of the relative rates of attrition. If ($m = 1$) the consequent coefficient of 9 implies a 3:1 defender's advantage, as well as a 3:1 loss rate favoring the defender when the force ratio is in fact 3:1. One could modify the relationship based upon such factors as fatigue, logistics difficulties, morale, air superiority, or level of training; if the net result is an m greater than one, the equation would shift in favor of the defender. Conversely, if the net result is an m less than one the the opposite effect would occur (as shown in Example 3, above). This variant, like the second one, requires that an estimate of the likely or acceptable loss rate be made for one of the forces. Additionally, some value for m would have to be determined; the above example assumed a standard value of .75 for each intangible factor that affects m .

The fourth method of wargaming requires no mathematical equations or adjudicatory rules; rather, the war gamers themselves determine combat resolution. It is usually beneficial to have an

impartial umpire who can determine reasonable outcomes while being unencumbered either by the biases of the wargaming parties, or by a complicated set of rules for war-game resolution. The process would simply consist of sequential repositioning of the appropriate icons, and informal assessments such as: "At the end of two hours, 1st Brigade should reach Phase Line Orange and still be at 90% strength." This will usually be the preferred method when little time is available.

Normally, battle staffs should reflect units two levels below their own echelons; for example, divisions should account for maneuver battalions.³⁶ Some specialty units, such as MLRS batteries and cavalry troops, can be portrayed at the division level. On the other hand, it might be more convenient to limit the number of icons by consolidating certain units. For example, a Soviet Motorized Rifle Division could be represented by six icons for the following:

TABLE 12: Sample Representation of Soviet MRD

39th 64s Motorized Rifle Division (Division 89) (T-64)

39 Recon Battalion	84
146 GMR (BTR)	1,164 ^a
150 GMR (BTR)	1,164 ^a
144 GMR (BMP)	1,379 ^a
145 GMR (BMP)	1,157
39 MRD Div Troops	559 ^b

Note a. Includes a 4-battalion Regimental Artillery Group.

Note b. Includes Division Artillery Regiment (465) (assumed to be the strength of the DAG), Anti-tank battalion (79), and "MRD Base" (55) which includes armored vehicles not otherwise accounted for.

V. BATTLE MONITORING

During actual operations, a unit's current location should be reflected by the icon's position on the map; this enables the commander and staff to track the battle and to calculate rapidly relative combat strengths in localized areas. If spot reports or other events are also reflected on the map, these should be recorded with a different type of marker (see example in Appendix 1). CPS scores on the icons should be updated to reflect status changes and task organizations during the battle; these changes should be posted on the "order of battle" list as well.

For a graphic portrayal of unit strength, two other methods can be useful. First, a "status board" can be kept which depicts friendly and enemy unit symbols. These symbols are then partially colored in to reflect attrition, as shown in Appendix 1. A second, more detailed method is to represent each individual weapon system in a unit, either by a symbol or an alpha-numeric code. Annotations can subsequently be made to reflect suspected or confirmed losses; these can be differentiated by color-coding or some other method, as shown in Table 13.

TABLE 13: Individual System Array (Motorized Rifle Regiment)

303rd MR (MR) (B-MR, I-MR, F-MR, H-MR) (// = suspected loss, X = confirmed loss)
CPS (original) = 1,157 CPS (current) = 780 (67%)

1ST BN: XXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXX	28/45	XXXXXXXX= 8/8
2ND BN: XXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXX	32/45	XXXXXXXX= 8/8
3RD BN: XXXXXXXXXXXX XXXXXXXXXXXX XXXXXXXXXXXX XXXXXXXXXXXX XXXXXXXXXXXX	45/45	XXXXXXXX= 8/8
TR BN: XXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXX ? = // /31 3 3	Regt MRs = // /141	
AT CO: AT-5 AT-5 AT-5 AT-5 AT-5 AT-5 AT-5 AT-5 AT-5 AT-5	9/9	
RECON CO: 3		
ADA BTRY: 250 250 250 250 SA-9 SA-9 SA-9 SA-9		
122 SP BN: 251 251 251 251 251 251 251 251 251 251 251 251 251 251 251 251	18/18	

As reports are received and recorded, they can periodically be consolidated and used to update CPS values. For example, the above annotations were made after an engagement in which an estimated twenty T-64s and thirty BMP-2s were destroyed. From Appendix 2, Tables B-1 and B-2, the T-64 and BMP-2 Individual System Values (ISV, or simply the Weapon Value times the Category Weight) are extracted, and then multiplied by the respective losses to determine the CPS reduction.

TABLE 14: Updating a Unit's CPS (Method 1)

1. Original CPS = 1,157 (Div 89 BMP BRG in rolling terrain)
2. Estimated Losses: 20 T-64s
30 BMP-2s
3. Individual System Values (ISV) (From Appendix 2, Tables B-1 and B-2)

T-64 ISV = 12.50
BMP-2 ISV = 4.22

4. CPS losses:

$20 \times 12.50 = 250$
 $30 \times 4.22 = \underline{127}$
377

5. Revised CPS and strength estimates:

$(1,157 - 377) = 780$
 $(780/1157) = 67\% \text{ strength}$

Similar methods can be used to update the CPS of friendly units, though it may prove more convenient to rely upon normal status reports, and to estimate the CPS based upon the operational status of the dominant weapon systems in the unit. For example, after an engagement the updated CPS for the tank-heavy brigade in Table 15 might be estimated as follows:

TABLE 15: Updating a Unit's CPS (Method 2)

A. 1st Brigade CPS (Full-Strength, based upon task organization) 2,354
B. Status of Primary Systems^a:

	<u>Authorized</u>	<u>Operational</u>	<u>Operational Rate</u>
M-1 Tanks	116	106	91%
M-2 IFVs	54	43	80%

C. Estimated Overall Unit Combat Effectiveness Rate: 88%^b

D. Updated CPS: $2,354 \times .88 =$ 2,072

NOTE A: Personnel strengths should be used for light infantry units.

NOTE B: The estimate is between the operational rates for M-1s and M-2s. The estimate is skewed towards the M-1 rate, since the brigade is tank-heavy.

VI. IMPLICATIONS FOR FURTHER RESEARCH

At least three major opportunities for future refinements exist. The first is that at present the methodology does not account for such vital battlefield assets as air power, air defense, and engineer support. The first two categories, at least, might hypothetically be adapted to the methodology through further research. Indeed, early versions of the WEI/WUV methodology included an "air defense" category; this was later dropped to simplify the approach, since air defense weapons are most significant against air forces not included in the model.

The incorporation of air power would clearly change that, and it is possible, in the abstract at least, to envision a relationship such as "generally speaking, an A-10 sortie provides about as much combat power as do three tanks." This would be the first step towards assigning CPS values to fixed-wing aircraft.

A second potential area for further research is the

integration of this system with the Maneuver Control System (MCS) and the Battlefield Planning System (BPS). Although the CPS methodology is readily managed with spreadsheet software, it nevertheless remains a manual system which requires continual recalculations as the available information changes.

The third, and most difficult, area returns to the original question of how best to estimate combat power. The CPS methodology, at best, provides a rough quantitative base from which qualitative judgements will have to be made; in other words, "military art" cannot be made wholly "scientific." Nevertheless, one can conceptually try to measure even more of the "unmeasurable" than has been attempted here; this would necessitate a quantification of the "intangible factors" addressed earlier. While this is beyond the scope of the immediate study, such an approach might include a series of coefficients as shown in Table 16.

In the following example, two forces are assumed to have equal CPS values of 1,000. However, five "intangible factors are then accounted for to illustrate that one force indeed has a demonstrable advantage. All of the enhancing values are assumed to be 1.25 while the degradation values are all .75; in other words, for example, a side that has air supremacy is assumed to receive a 25% increase in its combat potential. Conversely, the opposing side is assumed to have a 25% decrease. The factors and values in the table are merely to suggest lines of inquiry; further research would be required to determine the appropriate

intangible factors, and the proper values to be assigned to each one.

TABLE 16: Accounting for Intangible Factors

$$\text{Let Combat Power} = CPS [(IA) \times (IA) \times (IA) \dots \times (IA)]$$

NOTE: The following identified factors and the values are illustrative only.

FACTOR	IMPACT OF INTANGIBLE FACTOR		
	Significantly Positive	No Effect	Significantly Negative
IA = Level of Training/Combat Experience	1.25	1	.75
IA = Air Force Situation	1.25	1	.75
IA = Logistical Situation	1.25	1	.75
IA = Ideological Motivation	1.25	1	.75
IA = Fatigue Level	1.25	1	.75

If two adversaries had equal CPS values of 1.000, but the above "intangible" factors had a uniformly positive effect on A and, conversely, a uniformly negative effect on B, the resultant combat power ratio would be estimated as follows:

$$\text{Combat Power} = CPS \times IP1 \times IP2 \times IP3 \times IP4 \times IP5$$

$$\text{Combat Power (A)} = (1.000) (1.25) (1.25) (1.25) (1.25) (1.25) = (1.000) (3.05) = 3.050$$

$$\text{Combat Power (B)} = (1.000) (.75) (.75) (.75) (.75) (.75) = (1.000) (.24) = .240$$

$$\text{Combat Power Ratio} = 12.7 : 1$$

SUMMARY

This study offers a methodology to estimate the relative combat strengths of opposing units, while meeting three criteria. First, it is detailed in that unique scores have been assigned to different units based upon the organizations' force structures and upon the capabilities of their weapons systems. Second, the methodology is simple enough to be understood by battle staffs and is easy to use. Finally, the methodology is adaptable enough to

be modified if, for example, the user wishes to make changes based upon new force structures, the fielding of newer and more capable weapons systems, or if the user disagrees with certain numerical values contained in this study and prefers to substitute other ones.

Appendix 1 contains pre-calculated Combat Potential Scores (CPSs) for units from several nations, which can be extracted in accordance with the desired level of aggregation. Appendix 1 includes CPSs for different types of terrain; however, the reader may prefer to rely exclusively upon the "rolling" values for simplicity. Appendix 2 includes the Weapon Values (WVs) and Category Weights (CWs) which were used to develop the CPSs in Appendix 1. The interested reader may use Appendix 2 to reconstruct or adjust the CPS calculations, or to generate Combat Potential Scores for units not that do not appear in Appendix 1.

The methodology can aid battle-staff war gaming and the monitoring of tactical operations. Because it seeks to balance the contradictory virtues of simplicity and detail, it does not attempt to quantify many of the less tangible elements of combat power; nor can it be expected to. However, the methodology can be used to sketch a general picture of opposing strengths, and in this regard is better than no method at all. It can assist good tactical judgement in division and corps staffs; it cannot serve as its substitute.

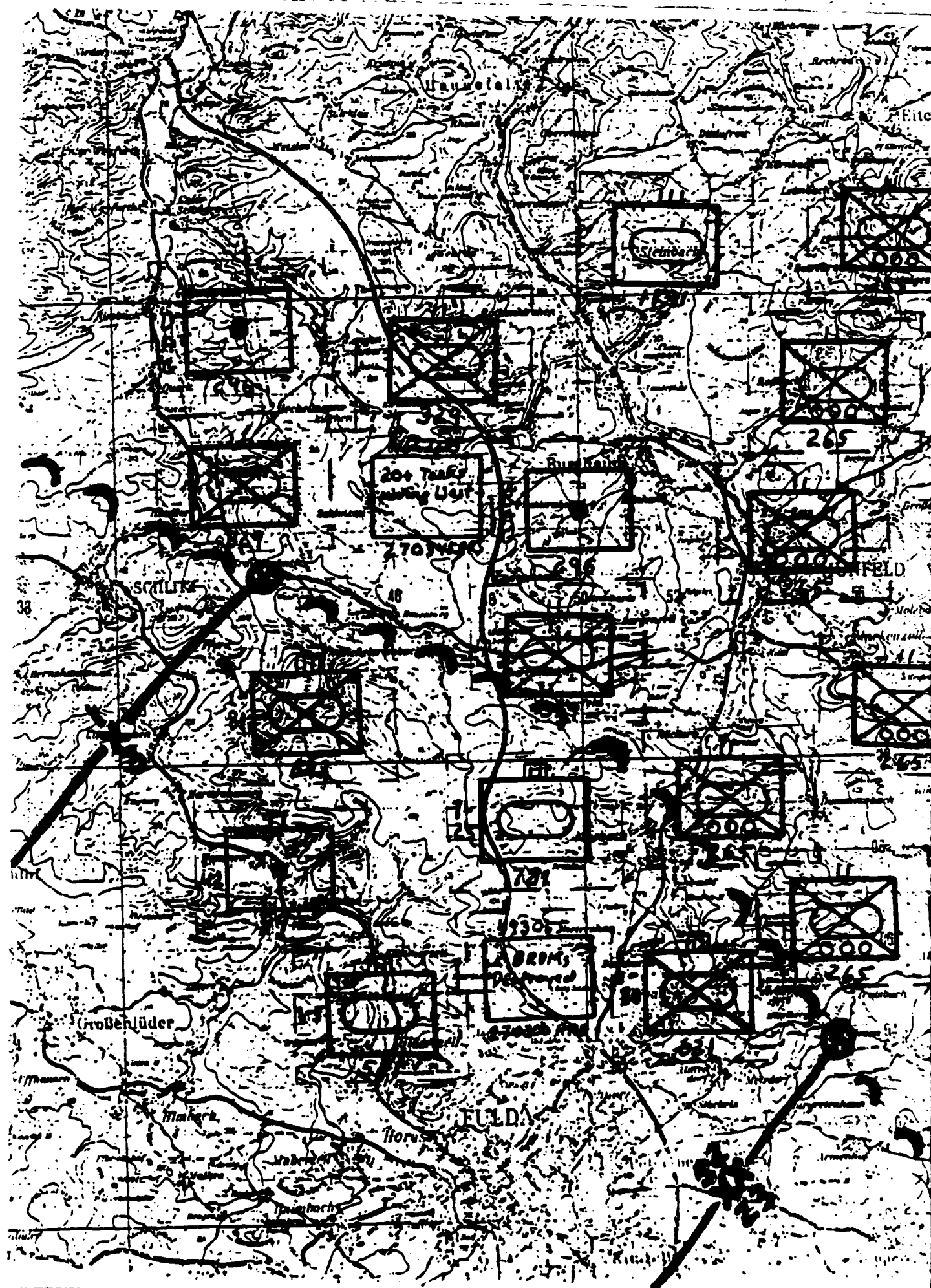
APPENDICES

APPENDIX 1: Combat Potential Scores (CPS) For Selected Units

INSTRUCTIONS: This appendix contains pre-calculated Combat Potential Scores for units of different countries. Given a friendly task organization and an enemy order of battle, the staff officer can estimate the force values at any desired level of aggregation. For example, a full-strength US division aggregated by battalion would be arrayed as follows:

<u>33rd Armored Division</u>	<u>Auth CPS</u>	<u>% Strength</u>	<u>Current CPS</u>
1st Brigade (2.354)	.....(92%)	..... (2.163)	
TP 1-91 Mech (2H. 2T)	693	90%	624
TP 1-10 Ar (1H. 3T)	781	95%	742
TP 1-11 Ar (1H. 3T)	781	90%	703
1-50 PA (155 SP) (DS)	99	95%	94
2nd Brigade (2.354)	.....(70%)	..... (1.648)	
TP 1-92 Mech (3H. 1T)	552	65%	359
TP 1-12 Ar (1H. 3T)	781	70%	547
1-13 Ar (4T)	922	75%	692
1-51 PA (155 SP) (DS)	99	50%	50
3rd Brigade (2.766)	.....(83%)	..... (2.306)	
TP 1-93 Mech (2H. 2T)	693	85%	589
TP 1-94 Mech (3H. 1T)	552	80%	442
TP 1-14 Ar (2H. 2T)	640	90%	576
TP 1-15 Ar (1H. 3T)	781	80%	625
1-52 PA (155 SP) (DS)	99	75%	74
23d Avn Brigade (-) (602)	.....(78%)	..... (467)	
146th ADB (AM-1)	301	75%	226
147th ADB (AM-1)	301	80%	241
Div Trps: (651)	.....(95%)	..... (620)	
1-22 Cav	306	90%	275
B/53 PA (MLAS)	152	100%	152
Other	193	100%	193
<u>Division Total:</u> (8.727)	(83%)	(7.204)	

The above CPS values should then be reflected on unit icons that are posted on situation maps. Additionally, a list such as the above should be maintained that includes authorized strengths (as modified by task organization) and current strengths, as updated strength reports are received. This information can be used to display percent strengths as well as the combat power ratios between friendly and enemy forces at any desired level.



APPENDIX 1: Combat Potential Scores (CPS)

10TH CORPS

COMBAT RATIO

2 CAA

22,808 ← 11,011 → 23,111
Full Strength CPS Start Full Strength CPS

17,497 ← 6,221 → 14,492

Current CPS

Current

Current CPS

77%

63%

Current %

Current %

10TH CORPS UNITS

XX



62

8401/7000 (85%)

X



1

2364/

1847/

2766/

X



2

X



3

X



1

2364/

2364/

2766/

XX



23

8911/6005 (73%)

X



2

X



3

X



1



1

449/

169/

908/



2



3

III



208

2882/3600 (65%)

X



10

2222/5518 (71%)

X



66

392/314 (80%)

OPFOR ON REVERSE SIDE

2ND COMBINED ARMS ARMY

XX
3
5334/2,137 (40%)

III
1202/
III
1202/
III
987/
III
1291/

XX
14
5334/2,550 (48%)

III
1202/
III
1202/
III
987/
III
1291/

XX
9
5706/1,126 (32%)

III
1264/
III
1264/
III
1049/
III
1477/

XX
2
6770/5,404 (81%)

III
1681/
III
1681/
III
1681/
III
1264/

III
6
986/937

III
42
1264/1136

III
78
292/90

II
102/0

X
64
387/166

X
8
243/207

APPENDIX 1: Combat Potential Scores (CPS) For Selected Units (continued)

TABLE A-1: US Force Values¹

US DIVISIONS

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
Rech Infantry (5x5) (H-1) ^a	8.401	6.647	7.957	6.225	8.010
Rech Infantry (5x5) (H-1A1) ^a ...	8.546	6.766	8.018	6.283	8.086
Armored (6x4) (H-1) ^a	8.911	7.089	7.750	6.083	7.864
Armored (6x4) (H-1A1) ^a	9.045	7.232	7.823	6.153	7.956
Brv Division Base ^b	345	252	489	372	485
Lt Infantry (9 In Bus)	1.589	1.169	3.004	2.263	2.541
Lt Infantry (motorised)	1.695	1.237	3.271	2.521	2.802
Airborne (9 Ahn Bus)	2.031	1.533	3.113	2.380	2.698
Air Assault (9 Bus)	2.515	1.902	3.813	2.660	3.108
2d Infantry ^c	4.524	3.554	4.942	3.641	4.656
ARMC Inf Division ^d	3.105	2.446	4.559	3.227	3.776
USMC Div	3.810	2.894	6.299	4.818	5.587
USMC MEF	4.387	3.340	7.115	5.318	6.352

NOTE a: Assumes AH-64s in Avn Bde: subtract 181 (rolling terrain) from CPS if AH-1s are in AH bus.

NOTE b: Includes HHS Battery and all H-113s (except ambulances) not found in maneuver battalions.

NOTE c: Includes 2 Armor, 2 Mechanized, 2 Infantry Battalions

NOTE d: 8 Infantry Bns, 1 Mechanized Bn, 1 Armor Bn (H-60A1)

US BRIGADES

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
2 Rech, 2 Tank (H-1) ^a	2.766	2.199	2.491	2.066	2.632
1 Rech, 2 Tank (H-1) ^a	2.354	1.890	1.822	1.516	1.951
2 Rech, 1 Tank (H-1) ^a	1.847	1.449	2.034	1.661	2.102
2 Rech, 2 Tank (H-1A1) ^a	2.826	2.247	2.515	2.089	2.663
1 Rech, 2 Tank (H-1A1) ^a	2.412	1.937	1.847	1.539	1.981
2 Rech, 1 Tank (H-1A1) ^a	1.876	1.473	2.046	1.673	2.117
Seg Inf Bde (2H, 2T) ^a	2.845	2.261	2.599	2.137	2.724
Lt Inf Bde ^b	340	242	780	625	674
Lt Inf Bde (mot) ^{b, c}	374	264	865	707	757
Ahn Bde ^b	542	422	1.015	714	791
Air Assault Bde ^b	542	422	1.015	714	791

CONTINUED

APPENDIX 1: Combat Potential Scores (CPS) For Selected Units (continued)

US BRIGADES (continued)

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
Ava Bde (Hvy Div) (AM-64)	1,089	857	1,121	610	841
Ava Bde (-) (Hvy Div) (AM-64) ^c ..	783	618	751	386	545
Ava Bde (Hvy Div) (AM-1)	908	714	948	521	715
Ava Bde (-) (Hvy Div) (AM-1) ^c ..	602	475	577	297	419
Ava Bde (Lt Div) (AM-1)	510	398	527	299	399
Ava Bde(-)(Lt Div) (AM-1) ^c	351	277	337	173	244
Ava Bde(-)(Lt Div) (AM-64) ^c	456	360	438	225	313
Att Hel Bde (AM-64) ^d	2,222	1,754	2,133	1,096	1,548
Heavy Division Arty ^d	449	342	832	549	734
Lt Division Arty ^d	216	164	500	325	434
Abn Division Arty ^d	156	118	362	235	314
AAST Division Arty ^d	156	118	362	235	314
USMC HEP ^e	1,536	1,152	2,665	2,037	2,362
USMC MPF Bde ^e	2,396	1,865	3,304	2,383	2,872

NOTE a: Includes 155mm Arty Bn DS (CPS = 99 in rolling terrain)

NOTE b: Includes 105 T Arty Bn DS (CPS = 52 in rolling terrain)

NOTE c: Does not include Cavalry Sqdn (CPS Heavy Cav Sqdn = 306; CPS Light Cav Sqdn = 159)

NOTE d: Five AM-64 Battalions (18 AM-64s per battalion), 1 Air Cav Sqdn (16 AH-1s)

NOTE e: Includes DS artillery battalions.

NOTE f: Includes Lt Inf Bdes with enough attached vehicles to lift entire unit.

US REGIMENTS

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
Armored Cav Regt (M-1)	2,882	2,321	2,128	1,563	2,069
Armored Cav Regt (M-1A1)	2,943	2,371	2,154	1,588	2,102
USMC Regt (w/ DS artillery)	584	423	1,316	1,016	1,118
USMC Artillery Regt	317	241	735	478	638

CONTINUED

APPENDIX 1: Combat Potential Scores (CPS) For Selected Units (continued)

US BATTALIONS/SQUADRONS

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
US Infantry and Armor Battalions/TTs					
Reck Bn	412	310	669	550	681
Reck Bn Base: HHC, E Co	135	110	201	113	142
Reck Bn (H113)	273	208	451	305	391
Tk Bn (H-1)	922	752	462	408	535
Tk Bn (H-1A1)	951	776	474	420	550
Tk Bn (H-60A3)	719	586	377	327	428
Tk Bn Base: HHC	82	64	109	72	91
Reck TT: 4H, 1 st	621	482	757	633	793
Reck TT: 3H, 1 st	552	432	640	524	658
Reck TT: 2H, 1 st	483	382	523	415	523
Reck TT: 2H, 2 nd	693	554	611	499	634
Reck TT: 1H, 1 st	414	332	406	306	388
Reck TT: 1H, 2 nd	624	504	494	390	499
Reck TT: 1H, 3 rd	834	676	582	474	610
Tk TT: 1H, 4 th	991	802	578	517	670
Tk TT: 1H, 3 rd	781	630	498	433	559
Tk TT: 1H, 2 nd	571	458	402	349	448
Tk TT: 1H, 1 st	361	286	314	265	337
Tk TT: 2H, 2 nd	640	508	519	458	583
Tk TT: 2H, 1 st	430	336	431	374	472
Tk TT: 3H, 1 st	499	386	548	483	607

NOTE x: Assumes H-1 and H-2 Companies.

if H-1A1: add 7 per tank company to CPS.

if H-60A3: subtract 49 per tank company from CPS.

if H-113: subtract 36 per mech company from CPS.

US Light Infantry Battalions

Lt Inf Bn	96	67	220	182	190
Lt Inf Bn (motorized) ^b	107	75	248	210	218
Inf Bn (2nd ID and Reserve)	168	130	311	215	236
Air Assault Bn	163	128	298	212	229
Abn Bn	163	128	298	212	229
Ranger Battalion	96	67	220	182	190

NOTE A: Assumes enough truck augmentation for 100% mobility.

CONTINUED

APPENDIX I: Combat Potential Scores (CPS) For Selected Units (continued)

US BATTALIONS/SQUADRONS (continued)

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
US Aviation Battalions					
AB-Bn (AB-64)	391	309	375	193	272
AB-Bn (AB-1)	301	237	289	148	210
US Cavalry Squadrons					
Regimental Cav Sqdn (H-1)	813	657	567	447	586
Regimental Cav Sqdn (H-1A1) ...	834	674	576	456	597
Regt Aviation Sqdn	434	343	417	214	303
Div Cav Sqdn (Heavy Div)	306	239	370	224	296
Div Cav Sqdn (Light Div)	159	121	191	126	154
US Artillery Battalions					
FA Bn: 8" (18 tubes).....	85	65	198	129	172
FA Bn: 155 SP (18 tubes).....	74	57	172	112	150
FA Bn: 155 SP (24 tubes).....	99	75	230	149	199
FA Bn: 155 T (18 tubes).....	59	45	138	90	120
FA Bn: 155 T (24 tubes).....	89	68	207	134	179
FA Bn: 105 T (18 tubes).....	52	40	121	78	105
FA Bn: 105 T (24 tubes).....	69	53	161	104	140
MLRS Bn (27 launchers).....	456	347	425	304	407
Lance Bn (6 launchers)	101	77	95	68	90
USMC Battalions					
USMC Bn.....	132	89	331	288	294
USMC Bn (Lt Arm Inf) (LAV) ^a	305	234	494	387	479
USMC Bn (Ault Amphib Bn) (LVT) ^a	418	295	751	586	756
USMC TB Bn (70 M-60A3, 72 TOW) ..	1,109	931	691	455	600
USMC TB Bn (56 M-1, 72 TOW).....	1,174	984	718	481	634
USMC Recon Bn.....	82	52	204	197	199
USMC BNW.....	356	268	600	447	519

NOTE: *a*: CPS values assume that infantrymen are in vehicles; these vehicles are usually organic to one of the regular rifle battalions.

CONTINUED

APPENDIX 1: Combat Potential Scores (CPS) For Selected Units (continued)

US COMPANIES/BATTERIES/TROOPS

Rolling Desert Mountain Urban Forested

US Infantry and Armor Companies/Teams

Rech Company (H-2)	69	50	117	109	135
Rech Company (H-113)	39	27	69	54	70
Rech Co BQ	7	5	11	10	12
Tank Company (H-1)	210	172	88	84	111
Tank Company (H-1A1)	217	178	91	87	115
Tank Company (H-60A3)	161	132	68	64	85
Tank Co BQ (2 H-1)	30	25	13	12	15
Rech Co Tn: 3H, 17 th	130	99	141	133	167
Rech Co Tn: 2H, 27 th	169	133	131	124	158
Rech Co Tn: 2H, 17 th	109	84	106	100	126
Rech Co Tn: 1H, 27 th	148	118	96	91	117
Rech Co Tn: 1H, 17 th	88	69	71	67	85
Tk Co Tn: 37, 18 th	231	187	123	117	153
Tk Co Tn: 27, 18 th	171	138	98	93	121
Tk Co Tn: 27, 28 th	192	153	133	126	162
Tk Co Tn: 17, 28 th	132	104	108	102	130
Tk Co Tn: 17, 18 th	111	89	73	69	89
Rech Bn HHC	61	45	92	75	93
Tk Bn HHC	82	64	109	72	91
E Co (Rech Bn AT Co)	74	65	89	38	49

Light Infantry Companies

1st Inf Co	22	14	54	49	51
1st Inf Co (motorized)	25	16	63	58	59
Abn Co	22	14	54	49	51
AAST Co	22	14	54	49	51

USMC Companies

USMC Rifle Co	29	19	74	67	68
USMC Spec Co	39	28	100	74	81
USMC LAI Co (LAV)	43	31	73	69	85

NOTE: Assumes H-1 and H-2 platoons

if H-1A1: add 2 per tank platoon to CPS

if H-60A3: subtract 14 per tank platoon from CPS (rolling terrain)

if H-113: subtract 10 per rech platoon from CPS (rolling terrain)

APPENDIX 1: Combat Potential Scores (CPS) For Selected Units (continued)

US COMPANIES/BATTERIES/TROOPS (continued)

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
US Attack Helicopter Companies					
Ath Bde Co (AH-64)	130	103	125	64	91
Ath Bde Co (AH-1)	100	79	96	49	70
US Cavalry Troops					
Ivy Div Air Cav Troop	67	53	64	33	47
Ivy Div Ground Cav Troop	79	62	108	71	92
Cav Troop, Regt Cav Sqdn (H-1) ..	187	151	131	102	133
Cav Trp, Regt Cav Sqdn (H-1A1) ..	192	155	133	104	136
Lt Div Air Cav Troop	67	53	64	33	47
Lt Div Ground Cav Troop	25	16	62	60	61
US Artillery Batteries					
FA Btry: 8" (6 tubes) .....	.....	.....	.....	.....	.....
FA Btry: 155 SP (8 tubes)	33	25	77	50	66
FA Btry: 155 SP (6 tubes)	25	19	57	37	50
FA Btry: 155 T (8 tubes)	26	20	61	40	53
FA Btry: 155 T (6 tubes)	20	15	46	30	40
FA Btry: 105 T (6 tubes)	17	13	40	26	35
MRS Btry (9 launchers)	152	116	142	101	136

US PLATOONS

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
Hoch Inf Plt (H-2)	21	15	35	33	41
Hoch Inf Plt (H-113)	11	8	20	15	20
Tank Plt (H-1)	60	49	25	24	32
Tank Plt (H-1A1)	62	51	26	25	33
Tank Plt (H-60A3)	46	38	19	18	24
Lt Inf Plt	6	4	16	15	15
Cavalry Platoon	23	18	29	20	25
Scout Platoon, Hoch and Ar Bns ..	23	18	29	20	26
Scout Platoon, Lt Bn	6	4	16	15	15
AF Platoon (K Co)	24	21	29	12	15

APPENDIX 1: Combat Potential Scores (CPA) For Selected Units (continued)

TABLE A-2: Soviet Force Values¹⁰

SOVIET DIVISIONS

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
Soviet Motorized Rifle Divisions^a					
Div 80 MRD (T-80)	6.176	4.869	6.378	4.897	6.337
Div 80 MRD (T-64)	5.750	4.518	6.201	4.726	6.077
Div 80 MRD (T-72)	5.642	4.431	6.153	4.663	6.035
Div 80 MRD (T-62)	4.805	3.753	5.538	4.147	5.353
Div 80 MRD (T-55)	4.487	3.501	5.403	4.018	5.188
Div 89 MRD (T-80)	5.129	3.964	6.607	5.135	6.552
Div 89 MRD (T-64)	4.881	3.760	6.503	5.035	6.420
Div 89 MRD (T-72)	4.817	3.708	6.475	4.983	6.388
Div 89 MRD (T-62)	4.199	3.222	5.893	4.509	5.738
Div 89 MRD (T-55)	4.015	3.070	5.813	4.433	5.542
Post-CFE MRD (T-80)	5.706	4.468	6.335	5.019	6.428
Post-CFE MRD (T-64)	5.334	4.162	6.179	4.869	6.230
Post-CFE MRD (T-72)	5.238	4.084	6.137	4.791	6.182
Post-CFE MRD (T-62)	4.509	3.496	5.612	4.362	5.567
Post-CFE MRD (T-55)	4.233	3.268	5.492	4.248	5.423
MRD BASP	55	39	93	85	106

Note A: The "Division 80" MRD structure consists of one tank regiment, one BMP motorized rifle regiment, and two BTR motorized rifle regiments. Additionally, the division has an artillery regiment of three howitzer battalions and one multiple rocket launcher battalion, an attack helicopter squadron, a surface-to-surface missile battalion, an anti-tank battalion, and a recon battalion that includes six tanks. The MRD tank battalions have 40 tanks, while the TR tank battalions have 31. The tank regiment of an MRD does not include an MRD. There may also be an independent tank battalion (ITB) of 51 tanks (not included in the above figures).

The "Division 89" MRD structure (or "square" division) has two BMP MRDs and two BTR MRDs. Other changes include the deletion of the AR squadron and the SSN battalion, the removal of the six tanks from the reconnaissance battalion, and the standardization of all tank battalions at 31 tanks. An ITB is not normally present.

The "Post-CFE" MRD has one TR (without an MRD), two BMP MRDs, and one BTR MRD. Other changes to the "Division 89" structure include the deletion of six BM-21 rocket launchers from the RL battalion, and the addition of three AT-5 BRMs to the division AT battalion. Additionally, the MRDs now have an AT battalion (vice a battery) with the addition of six T-12 AT guns to the nine AT-5s already present. A reconnaissance platoon of three BRMs has also been added to each MRD. An ITB may be present, but now would consist of 31 tanks (not included in the above figures).¹¹

Note B: Includes armored vehicles not organic to the maneuver regiments.

APPENDIX 1: Combat Potential Scores (CPS) For Selected Units (continued)

SOVIET DIVISIONS (continued)

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
Soviet Tank Divisions ^a					
Div 80 TD (T-80)	7.130	5.655	6.062	5.086	6.560
Div 80 TD (T-64)	6.492	5.130	5.795	4.829	5.220
Div 80 TD (T-72)	6.328	4.997	5.723	4.704	5.138
Div 80 TD (T-62)	5.275	4.128	5.166	4.242	5.444
Div 80 TD (T-55)	4.801	3.740	4.961	4.047	5.197
Div 89 TD (T-80)	6.139	4.817	6.040	5.109	6.520
Div 89 TD (T-64)	5.643	4.409	5.832	4.909	5.256
Div 89 TD (T-72)	5.515	4.305	5.776	4.805	5.192
Div 89 TD (T-62)	4.643	3.593	5.256	4.373	5.552
Div 89 TD (T-55)	4.275	3.289	5.096	4.221	5.360
Post-CFB TD (T-80)	6.770	5.365	5.821	4.936	6.349
Post-CFB TD (T-64)	6.150	4.855	5.561	4.686	6.019
Post-CFB TD (T-72)	5.990	4.725	5.491	4.556	5.939
Post-CFB TD (T-62)	4.964	3.879	4.945	4.112	5.259
Post-CFB TD (T-55)	4.504	3.499	4.745	3.922	5.019
TD BALT ^b	55	39	93	85	106

Note *a*: The "Division 80" tank division structure has three T2s (three tank battalions of 31 tanks and one H2B) and one BMP H2B (three H2Bs and one tank battalion of 40 tanks). Divisional assets are the same as for the "Division 80" H2B, except that there is no divisional AT battalion, and the artillery regiment has only two howitzer battalions (instead of three).

The "Division 89" tank division is also "square" and has two tank regiments and two BMP H2Bs: all of the tank battalions have 31 tanks. The deletions at the divisional level are the same as for the "Division 89" H2B.

The "Post-CFB" tank division has three tank regiments and one H2B (the H2B probably has only two H2Bs, though the above figures assume that three are present. Other modifications are the same as for the "Post-CFB" H2B, except that there is no divisional AT battalion.⁴⁰

Note *b*: Includes armored vehicles not organic to the maneuver regiments.

Other Soviet Divisions

Airborne Division	1.393	1.055	2.129	1.742	2.184
Artillery Division	2.515	1.953	3.985	2.554	3.410
Seal Infantry Division	2.552	1.978	3.106	2.250	2.918

APPENDIX 1: Combat Potential Scores (CPS) For Selected Units (continued)

SOVIET BRIGADES AND GROUPS

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
Air Assault Bde (Front).....	457	326	911	678	795
AMBA Aslt Bde (Front)	356	263	749	562	614
Spetsnaz Bde (Front)	224	144	560	544	548
Naval Infantry Bde	1,059	819	1,319	941	1,224

Soviet Artillery Brigades^a

SSN Bde (16x300) (Army)	243	185	227	162	217
Arty Bde (Army) (48 B-20, 48 2A36) ..	387	294	897	582	778
RP Arty Bde(Front)(24 2S7,24 2S4) ..	222	168	551	327	412
RP Arty Bde (Post-CPE) (48 2S7) ..	268	203	621	403	538

Gun Bde (Arty Div) (72 B-30)	208	158	483	313	419
Gun-How Bde (Arty Div) (72 2S3) ..	282	215	655	425	568
How Bde (Arty Div) (72 2S7)	357	271	828	537	718
Rkt Lchr Bde (Arty Div)	1,069	813	998	714	955
AT Bde (Arty Div)	315	281	366	139	181

NOTE a: CPS values based upon organizations depicted in *PN 100-2-1*. Post-CPE alignment of artillery appears to consist of 18 tubes in divisional artillery battalions, and 12 tubes in other battalions (which might be expanded during war). All multiple rocket launcher battalions are being reduced from 18 to 12 launchers.⁴¹

Soviet Artillery Groups^{a2}

RAG (4 FA Bns) ^a	296	228	688	448	600
BAG (4 FA Bns) ^a	296	228	688	448	600
RAG (4 FA Bns) ^a	296	228	688	448	600
Army plus-up (12 bns) ^b	888	684	2,064	1,344	1,800
Division Arty plus-up (9 Bns) ^c ...	666	513	1,548	1,008	1,350
RAG plus-up (3 Bns) ^d	222	171	516	336	450

NOTE a: Artillery groups vary in size and composition; normally, they have from two to six battalions.⁴² These values assume the equivalent of four battalions of 2S5 152mm SP howitzers; other CPS values should be calculated if the specific composition of the artillery groups can be determined. These RAG, BAG, and RAG values include whatever organic artillery units have been assigned to the group; for example the RAG value includes the regiment's organic artillery battalion.

NOTE b: First-echelon armies may receive front-level artillery battalions to supplement their own artillery assets. These CPS values assume the equivalent of 12 frontal 2S5 battalions in addition to organic army artillery battalions.

NOTE c: First-echelon divisions may receive army and front-level artillery battalions, and battalions from second-echelon divisions, to supplement their own artillery assets. These CPS values assume the equivalent of 9 2S5 battalions in addition to organic division artillery battalions.

NOTE d: First-echelon regiments also receive the artillery assets of higher echelons. These CPS values assume the equivalent of 3 2S5 battalions in addition to the organic 2S1 artillery battalion.

APPENDIX 1: Combat Potential Scores (CPS) For Selected Units (continued)

SOVIET REGIMENTS						
	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>	
Soviet Motorized Rifle Regiments^a						
Div 80 HRR (BMP-2, T-80)	1,349	1,042	1,592	1,360	1,710	
Div 80 HRR (BMP-2, T-64)	1,269	976	1,559	1,328	1,667	
Div 80 HRR (BMP-2, T-72)	1,249	960	1,550	1,320	1,657	
Div 80 HRR (BMP-1, T-62)	1,081	826	1,422	1,200	1,503	
Div 80 HRR (BMP-1, T-55)	1,021	780	1,397	1,176	1,472	
Div 89 HRR (BMP-2, T-80)	1,219	935	1,538	1,308	1,641	
Div 89 HRR (BMP-2, T-64)	1,157	884	1,512	1,283	1,60*	
Div 89 HRR (BMP-2, T-72)	1,141	871	1,505	1,270	1,600	
Div 89 HRR (BMP-1, T-62)	1,000	760	1,388	1,168	1,450	
Div 89 HRR (BMP-1, T-55)	954	722	1,368	1,149	1,436	
Post-CFE HRR (BMP-2, T-80)	1,264	971	1,593	1,340	1,683	
Post-CFE HRR (BMP-2, T-64)	1,202	920	1,567	1,315	1,650	
Post-CFE HRR (BMP-2, T-72)	1,186	907	1,560	1,302	1,642	
Post-CFE HRR (BMP-1, T-62)	1,045	796	1,443	1,200	1,502	
Post-CFE HRR (BMP-1, T-55)	999	758	1,423	1,181	1,478	
Div 80 HRR (BTR-70, T-80)	1,134	890	1,362	942	1,215	
Div 80 HRR (BTR-70, T-64)	1,054	824	1,229	910	1,157	
Div 80 HRR (BTR-70, T-72)	1,034	808	1,220	902	1,153	
Div 80 HRR (BTR-60, T-62)	839	653	1,035	749	964	
Div 80 HRR (BTR-60, T-55)	779	607	1,010	725	933	
Div 89 HRR (BTR-70, T-80)	1,004	783	1,208	890	1,147	
Div 89 HRR (BTR-70, T-64)	942	732	1,182	865	1,114	
Div 89 HRR (BTR-70, T-72)	926	719	1,175	852	1,106	
Div 89 HRR (BTR-60, T-62)	758	587	1,001	717	921	
Div 89 HRR (BTR-60, T-55)	712	549	981	698	897	
Post-CFE HRR (BTR-70, T-80)	1,049	819	1,263	922	1,189	
Post-CFE HRR (BTR-70, T-64)	987	768	1,237	897	1,156	
Post-CFE HRR (BTR-70, T-72)	971	755	1,230	884	1,148	
Post-CFE HRR (BTR-60, T-62)	803	623	1,056	749	963	
Post-CFE HRR (BTR-60, T-55)	757	585	1,036	730	939	
HRR BAMP	49	44	57	22	28	

NOTE A: "Division 80" HRR has 40 tanks in the tank battalion. "Division 89" HRR has 31 tanks in the tank battalion. The "Post-CFE" HRR also has 31 tanks in the tank battalion; moreover, the regimental AT battery has been transformed into an AT battalion with the addition of six T-12 anti-tank guns. Another modification is the addition of a recon platoon (three BMPs) to each HRR. Under the Post-CFE organization, the HRR in the tank division probably has only two HRRs, rather than the three reflected above.

NOTE B: Includes all assets except for those organic to the maneuver battalions and to the reconnaissance company.

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APPENDIX I: Combat Potential Scores (CPS) For Selected Units (continued)

SOVIET REGIMENTS (continued)

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>	
Tank Regiments^a						
TR, TRD (T-60)	1,477	1,201	797	703	929	
TR, TRD (T-64)	1,291	1,048	719	628	830	
TR, TRD (T-72)	1,243	1,009	698	589	806	
TR, TRD (T-62)	964	775	581	499	656	
TR, TRD (T-55)	826	661	521	442	584	
TR, TD (T-60)	1,681	1,348	1,156	1,022	1,322	
TR, TD (T-64)	1,495	1,195	1,078	947	1,223	
TR, TD (T-72)	1,447	1,156	1,057	908	1,199	
TR, TD (T-62)	1,152	911	914	794	1,019	
TR, TD (T-55)	1,014	797	854	737	947	
TR BAST ^b	18	13	32	28	35	
Indep TR (T-60) ^c	2,513	2,031	1,546	1,387	1,798	
Indep TR (T-64) ^c	2,213	1,785	1,420	1,267	1,639	
Indep TR (T-72) ^c	2,138	1,724	1,388	1,237	1,599	

NOTE A: The tank regiment organizations have remain constant during the divisional reorganizations; in each case, all battalions have 31 tanks. Unlike its tank division counterpart, the tank regiment of the TRD has no TRD.

NOTE B: Includes regimental combat vehicles not accounted for under the maneuver battalions or reconnaissance company.

NOTE C: Army-level ITBs are being eliminated under the Soviet Army reorganization; they may be replaced by independent motorized rifle regiments.⁴⁴

Other Soviet Regiments

Airborne Regt (TRD)	348	260	587	492	610	
AT Regt (Army)	237	211	275	104	136	
Atk Sol Regt (Army)	986	778	946	532	712	
Artillery Regt (TRD) ^a	465	353	825	547	731	
Arty Regt (TRD) (Post-CPE) ^b	418	316	780	515	689	
Artillery Regt (TD) ^a	371	282	607	405	542	
Arty Regt (TD) (Post-CPE) ^b	324	245	562	373	500	
Rkt Lehr Bgt (Army) (54 BR-21) ...	567	416	510	365	488	
RL Regt (Army) (Post-CPE) (36 BR-21) ^b	292	222	272	195	260	
Reval Infantry Regiment	726	564	822	611	790	

NOTE A: TRD artillery regiments have three 152mm battalions, while the TD regiments have two.

NOTE B: Divisional and Army rocket launcher battalions have been reduced from 18 launchers to 12.⁴⁵

APPENDIX 1: Combat Potential Scores (CPS) For Selected Units (continued)

SOVIET BATTALIONS						
	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>	
Soviet Motorized Rifle Battalions^a						
MRB (BMP-2)	204	147	359	319	393	
MRB(+) (BMP-2, T-80) ^b	349	266	420	377	470	
MRB(+) (BMP-2, T-64) ^b	329	250	412	369	459	
MRB(+) (BMP-2, T-72) ^b	324	245	409	367	456	
MRB (BMP-1)	188	136	333	295	363	
MRB(+) (BMP-1, T-62) ^b	278	210	371	331	421	
MRB(+) (BMP-1, T-55) ^b	263	198	365	325	403	
MRB (BTR-70)	140	102	265	192	244	
MRB(+) (BTR-70, T-80) ^b	285	221	326	250	321	
MRB(+) (BTR-70, T-64) ^b	265	205	318	242	310	
MRB(+) (BTR-70, T-72) ^b	260	200	315	240	307	
MRB (BTR-60)	115	84	220	157	199	
MRB(+) (BTR-60, T-62) ^b	205	158	258	193	247	
MRB(+) (BTR-60, T-55) ^b	190	146	252	187	237	
MRB Base (BMP) ^c	45	33	92	67	84	
MRB Base (BTR) ^c	50	39	103	66	82	

NOTE a: Post-CFE MRB's may have a recon platoon of three BMPs (add 10 to CPS).

NOTE b: Includes attached tank company of ten tanks.

NOTE c: Includes mortar battery and automatic grenade launcher platoon. (BTR bn also has AT battery.)

Soviet Tank Battalions						
TB (40 T-80) (Div 80)	584	478	250	238	315	
TB (40 T-64) (Div 80)	504	412	217	206	272	
TB (40 T-72) (Div 80)	484	396	208	198	262	
TB (40 T-62) (Div 80)	364	295	158	150	198	
TB (40 T-55) (Div 80)	304	249	133	126	167	
TB(+) (40 T-80) (Div 80) ^a	637	516	339	322	418	
TB(+) (40 T-64) (Div 80) ^a	557	450	306	290	375	
TB(+) (40 T-72) (Div 80) ^a	537	434	297	282	365	
TB(+) (40 T-62) (Div 80) ^a	412	330	239	226	292	
TB(+) (40 T-55) (Div 80) ^a	352	284	214	202	261	
TB (31 T-80) (Div 89 & Post-CFE)	454	371	196	186	246	
TB (31 T-64) (Div 89 & Post-CFE)	392	320	170	161	213	
TB (31 T-72) (Div 89 & Post-CFE)	376	307	163	148	205	
TB (31 T-62) (Div 89 & Post-CFE)	283	229	124	118	155	
TB (31 T-55) (Div 89 & Post-CFE)	237	191	104	99	131	

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APPENDIX 1: Combat Potential Scores (CPS) For Selected Units (continued)

SOVIET BATTALIONS (continued)

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>	
TD(+) (31 T-80) (Div 89 & P-CFE) ^a	507	409	285	270	349	
TD(+) (31 T-64) (Div 89 & P-CFE) ^a	445	358	259	245	316	
TD(+) (31 T-72) (Div 89 & P-CFE) ^a	429	345	252	232	308	
TD(+) (31 T-62) (Div 89 & P-CFE) ^a	331	264	213	194	249	
TD(+) (31 T-55) (Div 89 & P-CFE) ^a	285	226	185	175	225	
Indep Tk Bn (51 T-80) ^b	740	606	311	296	391	
Indep Tk Bn (51 T-64) ^b	638	523	268	255	337	
Indep Tk Bn (51 T-72) ^b	612	502	257	245	324	
Indep Tk Bn (51 T-62) ^b	459	376	193	184	243	
Indep Tk Bn (51 T-55) ^b	383	314	161	153	202	

NOTE a: Tank battalion reinforced with BMP company of 10 BMPs.

NOTE b: "Division 80" structure may include an ITB of 51 tanks. "Division 89" structure does not have an ITB; some "Post-CFE" divisions have an ITB of 31 tanks.

Other Soviet Maneuver Battalions

Airborne Bn (BND)	93	67	161	147	182
Assult Gun Bn (Abn Div)	171	140	72	68	90
Assult Bn (BND) (AA< Bde)	115	83	217	178	219
Para Bn (AA< Bde)	93	66	212	168	179
Indep AA< Bn (Army)	102	71	228	191	214
Recon Bn (Div 80)	171	136	153	113	148
Recon Bn (Div 89 and Post-CFE)	84	66	105	72	94
AT Bn (BND and Army AT Regt)	79	70	92	35	45
AT Bn (Post-CFE)	95	85	111	42	55
Hel Sqdn (Div 80)	231	186	226	116	164
Wind Sqdn (Army AB Regt)	401	198	241	124	175
Rip Sqdn (Army AB Regt)	251	317	385	198	279

Soviet Artillery Battalions

PA 122m SP Bn (18 x 281)	63	48	147	95	127
PA 152m SP Bn (18 x 283)	71	54	164	106	142
PA 152m SP Bn (18 x 285)	74	57	172	112	150
PA 152m SP Bn (24 x 285)	99	75	230	149	199
PA 203m SP Bn (12 x 287)	59	45	138	90	120
PA 2236 Bn	85	65	198	129	172
PA 122m T Bn (18 x B-30)	52	40	121	78	105
PA 122m T Bn (24 x B-30)	69	53	161	104	140
PA 152m T Bn (18 x B-20)	59	45	138	90	120
PA 152m T Bn (24 x B-20)	79	60	184	119	160
PA 130m T Bn (18 x B-46)	59	45	138	90	120
PA 203m T Bn (12 x B-46)	50	38	115	75	100
PA Bn (AA< Bde)	93	71	149	100	133

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APPENDIX 1: Combat Potential Scores (CPS) For Selected Units (continued)

SOVIET BATTALIONS (continued)

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>	
Fvy 240m Htr Bn (12 x 254)	51	39	138	74	86	
RL Bn (Div) (18 x BM-21)	182	139	170	122	163	
RL Bn (Post-CFE) (12 x BM-21) ..	121	93	113	81	109	
SSH Bn (Div 80) (4 x SS-21)	81	62	76	54	72	

Other Soviet Battalions

Spetsnaz Bn (Army)	56	36	140	136	137
Naval Infantry Bn	105	77	187	135	173
Tk Bn (PT-76) (Naval Infantry)..	267	219	112	107	141

SOVIET COMPANIES

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>	
Motorized Rifle Companies						
MRC (BMP-2)	53	38	89	84	103	
MRC (+) (BMP-2, 3 T-80s)	97	74	107	101	126	
MRC (+) (BMP-2, 3 T-64s)	91	69	105	99	123	
MRC (+) (BMP-2, 3 T-72s)	89	68	104	98	122	
MRC (BMP-1)	48	35	81	76	94	
MRC (+) (BMP-1, 3 T-62s)	75	57	92	87	108	
MRC (+) (BMP-1, 3 T-55s)	71	53	90	85	106	
MRC (BTR-70)	30	21	54	42	54	
MRC (+) (BTR-70, 3 T-80s)	74	57	72	59	77	
MRC (+) (BTR-70, 3 T-64s)	68	52	70	57	74	
MRC (+) (BTR-70, 3 T-72s)	66	51	69	56	73	
MRC (BTR-60)	22	15	39	30	39	
MRC (+) (BTR-60, 3 T-62s)	49	37	50	41	53	
MRC (+) (BTR-60, 3 T-55s)	45	33	48	39	51	
Soviet Airborne/Air Assault Companies						
MCC (BMD)	26	19	44	41	51	
Asslt Co (BMD)	26	19	44	41	51	
Para Co (+) (Indep ASLT Bn) ...	24	17	54	47	49	
Airborne Co (BMD)	26	19	44	41	51	
Soviet Tank Companies						
Tk Co (T-80) ¹	145	119	61	58	77	
Tk Co (T-64) ¹	125	103	53	50	66	
Tk Co (T-72) ¹	120	98	50	48	63	
Tk Co (T-62) ¹	90	74	38	36	48	
Tk Co (T-55) ¹	75	62	32	30	40	
Asslt Gun Co (Abn Div)	55	45	23	22	29	

APPENDIX 1: Combat Potential Scores (CPA) For Selected Units (continued)

SOVIET COMPANIES (continued)

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>	
Soviet Recon Companies						
Recon Co (Regt)	23	18	29	20	26	
Recon Co (Div Recon Bn)	56	45	39	31	41	
Recon Co (Post-CYE Div Recon Bn) ..	20	15	24	17	22	
Recon Asslt Co (Div Recon Bn) ..	36	28	44	30	39	
Recon Co (AASTY Bde)	21	17	26	18	24	
Recon Co (Abn Div)	27	21	33	23	30	
Soviet Anti-tank Batteries						
AT Battery (AT-3) (Regt)	40	36	47	18	23	
AT Battery (AT-5) (Regt)	49	44	57	22	28	
AT Gun Btry (6 x T-12)	15	13	17	7	9	
ATCN Battery (HED AT Bn)	49	44	57	22	28	
ATCN Btry (Post-CYE HED AT Bn) ..	61	55	71	28	35	
Other						
120a Htr Btry (HED & AASTY Bns) ..	19	15	52	28	33	
120a Htr Btry (Post-CYE)''	14	11	13	21	25	
Spetsnaz Company	19	12	47	45	46	

SOVIET PLATOONS

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>	
MP (BMP-2)	13	10	22	21	26	
MP (BMP-1)	12	9	20	19	23	
MP (BYE-70)	7	5	13	10	13	
MP (BYE-60)	5	4	10	8	10	
MP (BMD)	8	6	13	12	15	
Tk Plt (T-80)	44	36	18	17	23	
Tk Plt (T-64)	38	31	16	15	20	
Tk Plt (T-72)	36	30	15	14	19	
Tk Plt (T-62)	27	22	11	11	14	
Tk Plt (T-55)	23	18	9	9	12	
ACS-17 Plt (HED and AASTY Bns) ..	6	5	15	10	13	
AT Plt (HED AT Btry)	16	15	19	7	9	

APPENDIX 1: Combat Potential Scores (CPS) For Selected Units (continued)

TABLE A-3: Iraqi Force Values¹⁷

IRAQI DIVISIONS

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
Infantry Div	1.894	1.429	3.429	2.560	2.876
Mechanized Div	3.916	3.049	5.271	3.987	4.926
Armored Div	4.091	3.221	4.876	3.697	4.592
Inf Div (Reg Gd)	2.404	1.828	4.012	3.036	3.428
Mechanized Div (Reg Gd)	5.312	4.177	5.736	4.581	5.714
Armored Div (Reg Gd)	6.083	4.837	5.658	4.546	5.716
SP Division (Reg Gd)	1.651	1.247	2.527	1.973	2.249

IRAQI BRIGADES/WINGS

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
Infantry Bde	329	237	741	571	626
Mechanized Bde	1.003	770	1.445	1.126	1.397
Armored Bde	1.178	942	1.050	836	1.063
Infantry Bde (Reg Gd)	392	284	867	671	732
Mechanized Bde (Reg Gd)	1.283	994	1.527	1.260	1.576
Armored Bde (Reg Gd)	2.032	1.637	1.398	1.192	1.533
Special Forces Bde	321	230	707	544	600
Armor Div Artillery	311	236	721	468	626
Mech Div Artillery	289	219	670	435	581
Inf Div Artillery	196	150	454	294	395
Artillery Bde (Corps) (54 B-30) ..	156	119	362	235	314
Rocket Bde (Corps) (FROG-7)	146	111	136	97	130
Air Wing (Corps)	441	348	423	218	307

IRAQI BATTALIONS

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
Infantry Bn	79	57	167	135	141
Mechanized Bn	202	153	330	271	337
Armored Bn (35 T-55)	293	241	151	128	169
Inf Bn (Reg Gd)	90	65	197	162	169
Mechanized Bn (Reg Gd)	210	157	345	286	353
Armored Bn (Reg Gd) (44 T-72) ..	574	469	265	244	323
Reconnaissance Bn (Div)	114	88	141	97	126
Reconnaissance Bn (Corps)	124	97	155	106	138
LT Bn	179	159	207	78	103

APPENDIX I: Combat Potential Scores (CPS) For Selected Units (continued)

IRAQI BATTALIONS (continued)

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
PA Bn: 155mm (SP)	74	57	172	112	150
PA Bn: 130mm (T)	59	45	138	90	120
RL Bn: 162mm-21	182	139	170	122	163
ST Bn	69	46	175	154	159
Commando Bn	59	39	149	130	134
Att Hel Sqdn (9 HIND)	165	131	159	82	115
Asslt Hel Sqdn (15 HUP)	188	148	180	93	131

APPENDIX 1: Combat Potential Scores (CPS) For Selected Units (continued)

TABLE A-4: North Korean Force Values¹¹

NORTH KOREAN CORPS¹¹

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
Infantry Corps	12,860	9,609	22,031	16,626	19,075
Infantry Corps (Reserve)	8,607	6,435	14,352	10,726	12,270
Armer Corps (T-62, BTR-60)	6,042	4,814	5,163	3,986	5,255
Armer Corps (T-62, BMP)	6,266	4,978	5,519	4,382	5,727
Armer Corps (T-72, BMP)	7,382	5,914	5,987	4,742	6,327
Rech Inf Corps (T-62, BTR-60)	6,300	4,812	10,701	8,262	9,777
Rech Inf Corps (T-62, BMP)	7,038	5,352	11,841	9,504	11,259
Rech Inf Corps (T-72, BMP)	7,596	5,820	12,075	9,684	11,559
Artillery Corps	6,541	4,984	10,672	7,139	9,545

NOTE: It is doubtful that the North Korean units are equipped with T-72s or BMPs at this time.

NORTH KOREAN DIVISIONS¹¹

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
Infantry Div	1,656	1,231	3,029	2,278	2,584
Infantry Div (Trk Mobile)	1,707	1,282	3,019	2,228	2,552
Infantry Div (Reserve)	1,129	825	2,234	1,687	1,845
Rocket Lehr Div (Arty Corps) ...	3,207	2,439	2,993	2,140	2,865

NORTH KOREAN BRIGADES/WINGS

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
Armer Bde (T-62, BTR-60)	1,383	1,106	993	803	1,055
Armer Bde (T-62, BMP)	1,439	1,147	1,082	902	1,173
Armer Bde (T-72, BMP)	1,718	1,381	1,199	992	1,323
Rech Inf Bde (T-62, BTR-60)	965	737	1,585	1,248	1,457
Rech Inf Bde (T-62, BMP)	1,088	827	1,775	1,455	1,704
Rech Inf Bde (T-72, BMP)	1,181	905	1,814	1,445	1,754
Light Infantry Bde	756	513	1,800	1,548	1,602
Sniper Bde	811	580	1,914	1,447	1,540
Artillery Bde	510	390	1,191	774	1,035
Rocket Launcher Bde	1,069	814	998	714	955

NORTH KOREAN REGIMENTS

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
Infantry Regt	326	237	621	493	532
Infantry Regt (Truck-Mobile) ...	342	244	681	559	605
Infantry Regt (Reserve)	326	237	621	493	532

CONTINUED

APPENDIX I: Combat Potential Scores (CPS) For Selected Units (continued)

NORTH KOREAN REGIMENTS (continued)

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
Division Artillery Regt	215	165	501	324	435
Division Mortar Regt	116	87	309	167	194
Nvy Arty Regt (Arty Corps) (287)	237	180	552	360	480
PRMG Regt (Arty Corps)	73	55	68	49	65

NORTH KOREAN BATTALIONS

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
North Korean Infantry Battalions					
Infantry Bn	72	51	166	137	143
Infantry Bn (Truck-Mounted)	73	49	181	157	163
Light Infantry Bn	84	57	200	172	178
Sniper Bn	81	58	191	145	154
Mechanized Inf Bn (D72)	73	53	141	100	126
Mechanized Inf Bn (DMP)	129	94	230	199	244
AT Bn (12 x 218-3).....	17	13	40	26	35

North Korean Tank Battalions

Armor Bn (T-72)	376	307	163	148	205
Armor Bn (T-62)	283	229	124	118	155
Armor Bn (T-55)	237	191	104	99	131
Armor Bn (T-34)	202	165	85	81	107
Armor Bn (PT-76)	202	165	85	81	107

North Korean Artillery Battalions

PA Bn: 18 x 201	63	48	167	95	127
PA Bn: 18 x 203	71	54	164	106	142
PA Bn: 18 x 207	79	60	184	120	160
PA Bn: 18 x D-30	52	40	121	78	105
PA Bn: 18 x D-20	59	45	138	90	120
PA Bn: 18 x D-46	59	45	138	90	120
Mortar Bn: 18 x 120mm	39	29	103	56	65
PRMG Bn (3)	24	18	23	16	22
SL Bn: 18x200-21	182	139	170	122	163
SL Bn: 18 x 20-24	170	129	159	114	152

APPENDIX 1: Combat Potential Scores (CPS) For Selected Units (continued)

NORTH KOREAN COMPANIES

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
North Korean Infantry Companies					
Infantry Co	16	10	38	36	37
Lt Inf Co	13	8	32	28	29
Inf Co (Truck-mobile)	19	12	47	45	46
Hech Inf Co (BYR-60)	22	15	39	30	39
Hech Inf Co (BMP)	36	26	61	57	70
AT Co (6 x AT-2, 6 x ZIS-3)	32	28	48	24	31
North Korean Tank Companies					
Tank Co (T-72)	120	98	50	48	63
Tank Co (T-62)	90	74	38	36	48
Tank Co (T-55)	75	62	32	30	40
Tank Co (T-34)	65	62	27	26	34
Tank Co (PT-76)	65	53	27	26	34
North Korean Recon Companies					
Recon Co (Inf Div)	18	14	22	15	20
Recon Co (BYR Bde)	22	17	28	19	25
Recon Co (BMP Bde)	33	25	40	28	36
Recon Co (Tk Bde)	65	53	27	26	34
Mortar Co (9 x 82mm)	14	11	38	20	24
Rkt Lehr Btry	73	55	68	49	65

APPENDIX 1: Combat Potential Scores (CPS) For Selected Units (continued)

TABLE A-5: British Force Values¹¹

BRITISH DIVISIONS					
	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
Infantry Division	1,914	1,435	3,895	2,884	3,263
Armoured Division (2 Bdes) ^a	3,967	3,243	3,410	2,423	3,024
Armoured Division (2 Bdes)(+) ^b ..	4,567	3,710	4,241	2,964	3,741
Artillery Division	732	556	852	590	791

NOTE A: British Armoured Divisions may have two or three brigades; brigades could be mechanized-heavy, tank heavy or balanced.¹²

NOTE B: The British 1st Armoured Division that deployed during Desert Storm had two brigades and was augmented with a corps-level reconnaissance regiment, a heavy artillery regiment with howitzers, and a another heavy artillery regiment with MLRS.¹³

BRITISH BRIGADES					
	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
Armoured Brigade (Tk heavy)	2,159	1,770	1,560	1,187	1,558
Armoured Brigade (Mech heavy) ..	1,507	1,236	1,561	1,088	1,256
Infantry Brigade	487	354	1,050	801	884
Infantry Brigade (Motorized) ...	702	533	1,343	999	1,113

BRITISH BATTALIONS/REGIMENTS					
	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
Mechanized Battalion (Warrior) ..	366	281	594	451	558
Mechanized Battalion (PV 432) ..	252	209	444	280	357
Motorized Battalion	193	146	376	285	307
Infantry Battalion	99	71	218	171	182
Armoured Regt (57 Challenger) ..	904	743	443	379	501
Armoured Regt (57 Chieftain) ...	676	556	347	288	380
Recon Regiment (Corps)	274	219	357	221	288
Royal Marine Commando	132	100	327	221	245
Rvy Arty Regt (16 155mm, 12 8") ..	123	94	285	185	248
Artillery Regiment (24 155 SP) ..	99	75	230	149	199
Artillery Regiment (24 105 SP) ..	79	60	184	119	160
Artillery Regiment (18 155 T) ..	51	45	138	90	120

BRITISH COMPANIES					
	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
Tank Squadron (14 Challenger) ..	203	166	85	81	107
Tank Squadron (14 Chieftain) ...	147	121	62	59	78
Mech Company (Warrior)	72	52	124	113	139
Mech Company (PV 432)	34	28	74	56	72
Infantry Company (motorized) ...	24	16	60	55	56
Infantry Company	20	13	49	45	46

APPENDIX 1: Combat Potential Scores (CPS) For Selected Units (continued)

TABLE A-6: French Force Values¹⁴

FRENCH DIVISIONS

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
Infantry Div	1.773	1.299	2.753	1.908	2.650
Armored Div	3.079	2.414	2.984	2.421	3.178
6th Lt Armored Div	1.748	1.311	2.705	1.820	1.544

FRENCH REGIMENTS

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
Regiments					
Heck Infantry Regiment	441	343	454	404	507
Armored Regiment	687	559	374	353	461
Motorized Regiment (VAB)	427	309	658	458	643
Airborne Regiment	116	84	249	191	205
Recon Regt (In Div, Lt Ar Div) ..	212	168	256	158	218
Reconnaissance Regiment (Corps) ..	255	192	345	256	332
Artillery Regiment (155mm T) ...	89	68	207	134	179
Artillery Regiment (155mm SP) ..	99	75	230	149	199

FRENCH BATTALIONS/COMPANIES

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
Alpine Chasseur Battalion	109	76	253	212	221
Heck Infantry Company	68	49	115	108	133
Hot Infantry Company (VAB)	85	61	131	94	132
Armored Company (Ar Regiment) ..	145	119	63	60	80
Armored Company (Heck Regt)	126	102	73	69	90
Recon Co (Arm Div)	46	37	55	32	42
AT Co (Arm Div)	60	53	69	26	34

APPENDIX 1: Combat Potential Scores (CPS) For Selected Units (continued)

TABLE A-7: German Force Values¹¹

GERMAN DIVISIONS

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
Panzer Grenadier Division	5.862	4.654	4.944	4.121	5.327
Panzer Division	6.566	5.247	5.027	4.224	5.494
Mountain Division	5.017	3.961	4.612	3.803	4.811

GERMAN BRIGADES/REGIMENTS

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
Panzer Grenadier Brigade	1.289	1.021	1.158	979	1.241
Panzer Brigade	1.993	1.614	1.241	1.082	1.408
Airborne Brigade	237	187	413	288	315
Mountain Brigade	444	328	826	661	725
Artillery Regiment (Div)	532	405	636	439	588

GERMAN BATTALIONS

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
Panzergrenadier Bn (IFV)	169	121	299	259	318
Panzergrenadier Bn (IFV-APC) ...	153	109	275	228	273
Panzer Battalion (Leo II)	618	506	263	250	330
Panzer Battalion (Leo I)	433	355	186	176	233
Panzer Battalion (M-48A3)	310	254	134	127	168
Mixed Bn (PzG heavy)	294	231	249	234	322
Mixed Bn (Pz heavy)	467	378	256	242	313
Airborne Battalion	72	53	152	122	128
Mountain Battalion	73	51	166	135	142
Jaeger Battalion	79	56	179	141	177
Security Battalion	41	26	102	99	126
Artillery Battalion (Bde)	74	57	172	112	150
Artillery Battalion (Div)	532	405	636	439	588
Rocket Launcher Bn (Div)	432	329	403	288	386
Recon Battalion (Div)	542	442	259	236	337

GERMAN COMPANIES

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
Pz Gren Co (IFV)	44	32	74	70	86
Pz Gren Co (APC)	28	20	50	39	41
Panzer Co	195	160	82	78	103
AP Co (Bde)	65	58	76	29	38
Recon Co (Bde)	36	28	44	30	39

APPENDIX 1: Combat Potential Scores (CPS) For Selected Units (continued)

**TABLE A-8: South Korean Force Values'
SOUTH KOREAN DIVISIONS**

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
Divisions					
Mechanized Division	5,918	4,506	8,342	6,788	8,446
Infantry Division (K-1)	1,768	1,333	3,243	2,521	2,810
Infantry Division (M-48A5)	1,660	1,245	3,198	2,478	2,752
Infantry Division (M-48A3)	1,606	1,200	3,175	2,456	2,724
Infantry Division (M-47)	1,552	1,156	3,163	2,434	2,695

SOUTH KOREAN BRIGADES

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
Brigades					
Armored Brigade	1,728	1,416	726	591	914
Mechanized Brigade	1,215	890	2,205	1,825	2,235
Artillery Brigade (Corps)	222	170	513	334	446

SOUTH KOREAN REGIMENTS

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
Regiments					
Infantry Regiment	322	233	758	597	530
Artillery Regt (Mech Div)	297	226	690	448	598
Artillery Regt (Inf Div)	230	177	535	346	455
Recon Regt (Corps)	322	233	758	597	530

Battalions

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
Battalions					
Armored (36 K-1)	432	354	181	173	229
Armored (36 M-48A5)	324	266	136	130	171
Armored (36 M-48A3)	270	221	113	108	143
Armored (36 M-47)	216	177	91	86	114
Mechanized (Motorized)	243	178	441	365	447
Infantry	74	53	177	143	150
Recon Bn (Mech Div)	88	67	158	95	117
Recon Bn (Inf Div)	75	48	186	180	183
Artillery (8" T)	67	51	155	101	135
Artillery (175mm)	63	49	144	96	126
Artillery (155 SP)	74	57	172	112	150
Artillery (155 T)	59	45	138	90	120
Artillery (105 T)	52	40	121	78	105
AT Bn (Corps) (24 TOWs)	101	90	118	44	58
AM Bn (Corps) (12 M-500)	120	95	115	59	84

APPENDIX 1: Combat Potential Scores (CPS) For Selected Units (continued)

SOUTH KOREAN COMPANIES

	<i>Rolling</i>	<i>Desert</i>	<i>Mountain</i>	<i>Urban</i>	<i>Forested</i>
Tank Company (11 K-1)	132	108	55	53	70
Tank Company (11 H-4815)	99	81	42	40	52
Tank Company (11 H-4813)	83	68	35	33	44
Tank Company (11 H-47)	66	54	28	26	35
Heck Infantry Company	65	47	118	101	124
Infantry Company	18	12	46	41	42

APPENDIX 2: Weapon Value (WV) Tables

INSTRUCTIONS: The unit Combat Power Scores (CPS) in Appendix 1 were calculated using the Weapon Values (WV) and Category Weights (CW) in this appendix. This study can be employed without referring to this appendix; however, the tables are included in case the reader must generate a CPS for a unique unit, or in case the reader chooses to alter the numbers based upon a disagreement with the figures used in this study. The methodology is shown in the following calculation. In this example, the CPS for a US tank-heavy brigade (M1 and M-2, in rolling terrain) with DS artillery is determined.

Tank-heavy Brigade CPS (Rolling Terrain)

<u>Weapon System</u>	<u>Quantity</u>	<u>x</u>	<u>Weapon Value</u>	<u>x</u>	<u>Category Weight</u>	<u>=</u>	<u>Subtotal</u>
M1 Tank	116	x	1.50	x	10.00	=	1,740
M-2 IFV	54	x	1.30	x	4.02	=	282
M-3 CTV	18	x	1.30	x	2.96	=	69
M-113	28	x	.50	x	2.76	=	39
M-901 IFV	18	x	1.15	x	4.96	=	103
4.2" Mortar (SP)	18	x	1.10	x	2.86	=	57
M-109 155mm (SP)	24	x	1.00	x	4.13	=	99
Brigade CPS							= 2,389

The following calculations show the alterations that would be required if a tank-heavy brigade were equipped with the M-1A1, under desert conditions.

Tank-heavy Brigade CPS (Desert Terrain)

<u>Weapon System</u>	<u>Quantity</u>	<u>x</u>	<u>Weapon Value</u>	<u>x</u>	<u>Category Weight</u>	<u>=</u>	<u>Subtotal</u>
M1A1 Tank	116	x	1.55	x	8.20	=	1,474
M-2 IFV	54	x	1.30	x	2.89	=	203
M-3 CTV	18	x	1.30	x	2.30	=	54
M-113	28	x	.50	x	1.95	=	27
M-901 IFV	18	x	1.15	x	4.42	=	91
4.2" Mortar (SP)	18	x	1.10	x	2.15	=	43
M-109 155mm (SP)	24	x	1.00	x	3.14	=	75
Brigade CPS							= 1,967

Calculations such as those above could be simplified by multiplying a weapon system's quantity by its Individual System Value (ISV), which is simply (WV x CW); these totals are also included in the attached tables. The ISV is particularly useful to update a unit's CPS after attrition; for example, if the brigade in the first example lost five tanks (ISV = 15.00 from the table), its new CPS would be: 2,389 - (5 x 15.00) = 2,314.

APPENDIX 2: Weapon Value (WV) Tables (continued)

TABLE B-1: Tanks

	WV	INDIVIDUAL SYSTEM VALUES (WV x CV)				
		(Rolling) CV=10.00	(Desert) CV=8.20	(Mountain) CV=4.20	(Urban) CV=4.00	(Forested) CV=5.20
M-1A1	1.55	15.50	12.71	6.51	6.20	8.20
M-1	1.50	15.00	12.30	6.30	6.00	7.94
Leopard 2	1.50	15.00	12.30	6.30	6.00	7.94
Challenger	1.45	14.00	11.89	6.09	5.80	7.67
AMX-30S	1.25	12.50	10.25	5.25	5.00	6.61
M-60 A-3, T-1	1.15	11.50	9.43	4.83	4.60	6.08
AMX-30B2	1.10	11.00	9.02	4.62	4.40	5.82
Chieftain, Leopard 1	1.05	10.00	8.61	4.41	4.20	5.55
M-60, Centurion	1.00	10.00	8.20	4.20	4.00	5.29
M-48A5, AMX-30	.90	9.00	7.38	3.78	3.60	4.76
M-551, M-48A3	.75	7.50	6.15	3.15	3.00	3.97
M41, M47, AMX13, JP Kanone	.60	6.00	4.92	2.52	2.40	3.17
T-80	1.45	14.00	11.89	6.09	5.80	7.67
T-64	1.25	12.50	10.25	5.25	5.00	6.61
T-72	1.20	12.00	9.84	5.04	4.80	6.35
T-62	.90	9.00	7.38	3.78	3.60	4.76
T-54/55, T-10	.75	7.50	6.15	3.15	3.00	3.97
PT-76, T-34	.65	6.50	5.33	2.73	2.60	3.44
ASU-85	.55	5.50	4.51	2.31	2.20	2.91
ASU-57	.45	4.50	3.69	1.89	1.80	2.38

TABLE B-2: Armored Personnel Carriers

	WV	INDIVIDUAL SYSTEM VALUES (WV x CV)				
		(Rolling) CV=2.76	(Desert) CV=1.95	(Mountain) CV=4.96	(Urban) CV=3.87	(Forested) CV=4.99
M-113, Spartan	1.00	2.76	1.95	4.96	3.87	4.99
FV-432, AMX-13 VCI	.90	2.48	1.76	4.46	3.48	4.49
LVTTP7, AMX-VAB, M-75, Saladin	.75	2.07	1.46	3.72	2.90	3.74
FV-1611, Transporter, TP-408	.60	1.66	1.17	2.98	2.32	2.99
Saracen, Sherland, Saxon	.45	1.24	.88	2.23	1.74	2.25
Short, Hummer Pig	.45	1.24	.88	2.23	1.74	2.25
BTR-80	.95	2.62	1.85	4.71	3.68	4.74
BTR-70	.90	2.48	1.76	4.46	3.48	4.49
BTR-60P	.65	1.79	1.27	3.22	2.52	3.24
BTR-50, BTRD	.50	1.38	.98	2.48	1.94	2.50
BTR-152	.45	1.24	.88	2.23	1.74	2.25

APPENDIX 2: Weapon Value (WV) Tables (continued)

TABLE B-3: Infantry Fighting Vehicles

	WV	INDIVIDUAL SYSTEM VALUES (WV x CV)				
		(Rolling) CV=4.82	(Desert) CV=2.89	(Mountain) CV=6.77	(Urban) CV=6.35	(Forested) CV=7.83
M-2 Bradley	1.30	5.23	3.76	8.80	8.26	10.18
Warrior	1.15	4.62	3.32	7.79	7.30	9.00
Viesel	1.15	4.62	3.32	7.79	7.30	9.00
X-200	1.00	4.02	2.89	6.77	6.35	7.83
Harder	1.00	4.02	2.89	6.77	6.35	7.83
AMX-10	1.00	4.02	2.89	6.77	6.35	7.83
LAV-25	.75	3.02	2.17	5.08	4.76	5.87
YPR-765	.75	3.02	2.17	5.08	4.76	5.87
BRP-2	1.10	4.42	3.18	7.45	6.99	8.61
BRP-1	1.00	4.02	2.89	6.77	6.35	7.83
BED	.65	2.61	1.88	4.40	4.13	5.09

TABLE B-4: Anti-Tank Weapons

	WV	INDIVIDUAL SYSTEM VALUES (WV x CV)				
		(Rolling) CV=4.96	(Desert) CV=4.42	(Mountain) CV=5.76	(Urban) CV=2.18	(Forested) CV=2.85
ITV	1.15	5.70	5.08	6.62	2.51	3.28
JPzr TOV	1.10	5.46	4.86	6.34	2.40	3.14
Swingfire	1.10	5.46	4.86	6.34	2.40	3.14
TOV/APC, HOT/APC	1.00	4.96	4.42	5.76	2.18	2.85
HOT/VAB	.85	4.22	3.76	4.90	1.85	2.42
TOV/Jeep	.85	4.22	3.76	4.90	1.85	2.42
SS-11/Veh	.80	3.97	3.54	4.61	1.74	2.28
HOT/Jeep	.75	3.72	3.32	4.32	1.64	2.14
Milan/Jeep, Rntac/Jeep	.55	2.73	2.43	3.17	1.20	1.57
Milan/Bent	.60	1.98	1.77	2.30	.87	1.14
106mm/Jeep	.60	1.98	1.77	2.30	.87	1.14
Dragon, 82mm RR	.20	.99	.88	1.15	.44	.57
BRBM/AP-5	1.10	5.46	4.86	6.34	2.40	3.14
BRBM/AP-3	.90	4.46	3.98	5.18	1.96	2.57
BRBM/AP-2	.80	3.97	3.54	4.61	1.74	2.28
AT-1/Jeep	.60	2.98	2.65	3.46	1.31	1.71
AT-3 Bent	.60	2.98	2.65	3.46	1.31	1.71
T-12 100mm	.50	2.48	2.21	2.88	1.09	1.43
BS3 M1944 100m	.60	1.98	1.77	2.30	.87	1.14
B-11 107m RR	.60	1.98	1.77	2.30	.87	1.14
AT-4	.60	1.98	1.77	2.30	.87	1.14
SPG-9 73m	.25	1.24	1.11	1.44	.55	.71
B10 82m	.20	.99	.88	1.15	.44	.57
D44 85m	.20	.99	.88	1.15	.44	.57

APPENDIX 2: Weapon Value (WV) Tables (continued)

TABLE B-5: Armored Reconnaissance Vehicles

	WV	INDIVIDUAL SYSTEM VALUES (WV x CV)				
		(Rolling) CV=2.96	(Desert) CV=2.30	(Mountain) CV=3.68	(Urban) CV=2.52	(Forested) CV=3.29
M-3 Bradley	1.30	3.85	2.99	4.78	3.28	4.28
AMX-10RC	1.10	3.26	2.53	4.05	2.77	3.62
Scorpion, Scimitar, ERC-90	1.00	2.96	2.30	3.68	2.52	3.29
Luchs, VBC 90	1.00	2.96	2.30	3.68	2.52	3.29
Grizzly, AMX, SPZ, M113CR, KBR	.80	2.37	1.84	2.94	2.02	2.63
Fox, Cougar, Lynx, M-113	.60	1.78	1.38	2.21	1.51	1.97
Ferrett, RHNUV	.40	1.18	.92	1.47	1.01	1.32
Jeep	.30	.89	.69	1.10	.76	.99
BRP	1.10	3.26	2.53	4.05	2.77	3.62
BRDM-2	1.00	2.96	2.30	3.68	2.52	3.29
BRDM-1	.90	2.66	2.07	3.31	2.27	2.96
BTR-70	.80	2.37	1.84	2.94	2.02	2.63
BTR-60	.75	2.22	1.73	2.76	1.89	2.47
BTR-40	.60	1.78	1.38	2.21	1.51	1.97

TABLE B-6: Light Infantry Platoons

		INDIVIDUAL SYSTEM VALUES (WV x CV)				
	WV	(Rolling) CV=5.68	(Desert) CV=3.63	(Mountain) CV=14.16	(Urban) CV=13.71	(Forested) CV=13.85
WITHOUT TRANSPORT						
Type A	1.10	6.25	3.99	15.58	15.08	15.24
Type B	.90	5.11	3.27	12.74	12.34	12.47
Type C	.80	4.54	2.90	11.33	10.97	11.08
Type D	.60	3.41	2.18	8.50	8.23	8.31
Type E	.30	1.70	1.09	4.25	4.11	4.15
WITH WHEELED TRANSPORT						
Type A	1.30	7.38	4.72	18.41	17.82	18.01
Type B	1.10	6.25	3.99	15.58	15.08	15.24
Type C	1.00	5.68	3.63	14.16	13.71	13.85
Type D	.80	4.54	2.90	11.33	10.97	11.08
Type E	.50	2.84	1.82	7.08	6.86	6.93

Type A: approx. 35 troops, light and medium AT weapons, night vision devices.

Type B: approx. 35 troops, light and medium AT weapons.

Type C: approx. 35 troops, light AT weapons.

Type D: approx. 35 troops, no AT weapons.

Type E: platoon-sized group of non-infantry soldiers.

APPENDIX 2: Weapon Value (WV) Tables (continued)

TABLE B-7: Attack Helicopters

	WV	INDIVIDUAL SYSTEM VALUES (WV x CV)				
		(Rolling) CV=16.71	(Desert) CV=13.19	(Mountain) CV=16.04	(Urban) CV=8.24	(Forested) CV=11.64
AH-64	1.30	21.72	17.15	20.85	10.71	15.13
AH-1	1.00	16.71	13.19	16.04	8.24	11.64
PAH-1 Gazelle, Daufin	.75	12.53	9.89	12.03	6.18	8.73
Lynx, Alouette	.75	12.53	9.89	12.03	6.18	8.73
MD 500	.60	10.03	7.91	9.62	4.94	6.98
HI-28 HAVOC	1.20	20.05	15.83	19.25	9.89	13.97
HI-24 HIND	1.10	18.38	14.51	17.64	9.06	12.80
HI-8 HIP	.75	12.53	9.89	12.03	6.18	8.73
HI-2 HOPLITE	.50	8.36	6.60	8.02	4.12	5.82

TABLE B-8: Artillery

	WV	INDIVIDUAL SYSTEM VALUES (WV x CV)				
		(Rolling) CV=4.13	(Desert) CV=3.14	(Mountain) CV=9.58	(Urban) CV=6.22	(Forested) CV=8.31
8" SP	1.15	4.75	3.61	11.02	7.15	9.56
155mm SP	1.00	4.13	3.14	9.58	6.22	8.31
8" T	.90	3.72	2.83	8.62	5.60	7.48
155mm T, Abbott 105mm SP	.80	3.30	2.51	7.66	4.98	6.65
105mm T	.70	2.89	2.20	6.71	4.35	5.82
Mk 19 AGL ^a	.26	1.07	.82	2.49	1.62	2.16
257 203mm SP (M1975)	1.20	4.96	3.77	11.50	7.46	9.97
255 152mm SP (M1981)	1.00	4.13	3.14	9.58	6.22	8.31
253 152mm SP (M1973)	.95	3.92	2.98	9.10	5.91	7.89
251 122mm SP (M1974)	.85	3.51	2.67	8.14	5.29	7.06
259 120mm SP	.75	3.10	2.36	7.19	4.67	6.23
D-4 203mm T (M1931)	1.00	4.13	3.14	9.58	6.22	8.31
D-20 152mm T	.80	3.30	2.51	7.66	4.98	6.65
2A36 152mm T (M1976)	1.15	4.75	3.61	11.02	7.15	9.56
D-1 152mm T (M1943)	.70	2.89	2.20	6.71	4.35	5.82
H-46 130mm T	.80	3.30	2.51	7.66	4.98	6.65
D-74 122mm T	.70	2.89	2.20	6.71	4.35	5.82
D-30 122mm T	.70	2.89	2.20	6.71	4.35	5.82
A-19 122mm T	.75	3.10	2.36	7.19	4.67	6.23
H-30 122 T (M1938)	.65	2.68	2.04	6.23	4.04	5.40
M1966 76mm T	.60	1.65	1.26	3.83	2.49	3.32
2TS-3 76mm T (M1942)	.35	1.45	1.10	3.35	2.18	2.91
AGS-17 AGL ^a	.26	1.07	.82	2.49	1.62	2.16

NOTE ^a: Automatic grenade launchers belong in a separate category; however, a category of this type was not included in the original survey. They are included under the "Artillery" category for convenience; the Weapon Value of .26 was determined by comparing Dupuy's Operational Lethality Index for an automatic grenade launcher (58) to his OLI for an M-109 howitzer (223).

APPENDIX 2: Weapon Value (VV) Tables (continued)

TABLE B-9: Mortars

	VV	INDIVIDUAL SYSTEM VALUES (VV x CV)				
		(Rolling) CV=2.86	(Desert) CV=2.15	(Mountain) CV=7.64	(Urban) CV=4.12	(Forested) CV=4.80
4.2"/APC. ANX 120	1.10	3.15	2.37	8.40	4.53	5.28
81mm/APC	1.00	2.86	2.15	7.64	4.12	4.80
4.2"/Grnd Mt. 120m T	.80	2.29	1.72	6.11	3.30	3.84
81mm/Grnd Mt	.70	2.00	1.51	5.35	2.88	3.36
60mm	.50	1.43	1.08	3.82	2.06	2.40
51mm	.30	.86	.65	2.29	1.24	1.44
254 240mm SP	1.50	4.29	3.23	11.46	6.18	7.20
M-240 240mm/Towed	1.25	3.58	2.69	9.55	5.15	6.00
M-160 160m T	1.10	3.15	2.37	8.40	4.53	5.28
2512 120m SP	1.00	2.86	2.15	7.64	4.12	4.80
2B11 120mm/Grnd Mt	.85	2.43	1.83	6.49	3.50	4.08
M1943 120mm/Grnd Mt	.75	2.15	1.61	5.73	3.09	3.60
2B9 82mm/Towed	.80	2.29	1.72	6.11	3.30	3.84
M1937 82mm/Grnd Mt	.55	1.57	1.18	4.20	2.27	2.64

TABLE B-10: Multiple Rocket Launchers and Surface-to-Surface Missiles

	VV	INDIVIDUAL SYSTEM VALUES (VV x CV)				
		(Rolling) CV=13.50	(Desert) CV=10.27	(Mountain) CV=12.60	(Urban) CV=9.01	(Forested) CV=12.06
MLRS	1.25	16.88	12.84	15.75	11.26	15.08
LARS	.70	9.45	7.19	8.82	6.31	8.44
VAP-80	.45	6.08	4.62	5.67	4.05	5.43
Lance	1.25	16.88	12.84	15.75	11.26	15.08
BH-27 (M1977)	1.00	13.50	10.27	12.60	9.01	12.06
BHD-25	.70	9.45	7.19	8.82	6.31	8.44
BH-24	.70	9.45	7.19	8.82	6.31	8.44
BH-22	1.10	15.85	11.30	13.86	9.91	13.27
BH-21	.75	10.13	7.70	9.45	6.76	9.05
BHD-20	.70	9.45	7.19	8.82	6.31	8.44
BH-14 (M1965)	.60	8.10	6.16	7.56	5.41	7.24
M1975	.65	8.78	6.68	8.19	5.86	7.84
PRG-7	.60	8.10	6.16	7.56	5.41	7.24
SCUD B	1.00	13.50	10.27	12.60	9.01	12.06
SS-21	1.50	20.25	15.41	18.90	13.52	18.09
SS-23	2.00	27.00	20.54	25.20	18.02	24.12

ENDNOTES

¹Carl von Clausewitz, *On War*, ed. and trans. Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976), 148-150. Clausewitz ultimately concluded that neither "art" nor "science" fits closely enough, and suggested that commerce and politics were more appropriate analogies.

²Leslie G. Callahan, Jr. "The Need for a Multidisciplinary Modeling Language in Military Science and Engineering" in *Modeling and Simulation of Land Combat*, ed. Leslie G. Callahan, Jr. (Atlanta, GA: Georgia Tech Research Inst., 1983), 1-2.

³Herbert K. Weiss, "Land Combat Modeling and Simulation Methodology: An Overview" in Callahan *Modeling and Simulation of Land Combat*, 23-25.

⁴Geoffrey Blainey, *The Causes of War*, third edition (New York, NY: The Free Press, 1988), 122.

⁵George Quester, "Six Causes of War" in *The Future of Nuclear Deterrence* (Lexington Books, 1987).

⁶For example, a realistic game situation might be the destruction of a key bridge over a major route. This event may or may not occur during the actual operation.

⁷The 3:1 ratio is a matter of dispute. On the one hand, it has been cited as a reasonably accurate "rule of thumb" by numerous sources: see B. H. Liddell Hart in *The German Generals Talk* (New York: Quill, 1979), 216; John J. Mearsheimer "Why The Soviets Can't Win Quickly in Central Europe" in *Conventional Forces and American Defense Policy* ed. Steven E. Miller (Princeton, NJ: Princeton University Press, 1986), 133; US Army Command and General Staff College *ST 100-9 Techniques and Procedures for Tactical Decisionmaking* (Fort Leavenworth, KS: USACGSC, 1991), page 4-2 (which states that a battalion in the defense should be able to defeat a regiment). Others, however, argue either that the accepted ratio underestimates the defender's advantage (see discussion in Liddell Hart, cited above) or overestimates it. For a thorough appreciation of the arguments concerning the validity of the 3:1 ratio, see the debate between Mearsheimer and Joshua Epstein that appeared in the Spring 1988 and Spring 1989 issues of *International Security*.

⁸Weiss, 23-24. See also Charles Grant, *The War Game* (New York, NY: St. Martin's Press, 1971), 13, for a brief historical summary of war gaming from ancient China and India, through the nineteenth-century Prussian General Staff, to the present day.

⁹A 1975 GAO report identified over 450 models then being used by the Department of Defense alone. Callahan, 5.

¹⁰This summary of the Lanchester equations is taken from Joshua M. Epstein, *The Calculus of Conventional War: Dynamic Analysis without Lanchester Theory* (Washington, DC: The Brookings Institution, 1985), 2. See also James G. Taylor, "An Introduction to Lanchester-Type Models of Warfare" and "Lanchester-Type Models That Reflect Continuous Spatial Distribution of Forces" both in Callahan; also see Frederick W. Lanchester *Aircraft in Warfare: The Dawn of the Fourth Arm* (London: Constable, 1916).

¹¹Epstein, 2.

¹²*Ibid.*

¹³Despite the plethora of equations in Dupuy's works, at any point it is unclear (1) Which numbers are being used? or (2) Where did the numbers come from? The reader can seldom confirm that Dupuy's values were actually calculated with the equations he so painstakingly develops.

¹⁴Trevor N. Dupuy, *Numbers, Predictions & War: The Use of History to Evaluate and Predict the Outcome of Armed Conflict* (Fairfax, VA: HERO Books, 1985), 20-27. Also see Dupuy's other works, including *Understanding War* (New York, NY: Paragon House Publishers, 1987) and *How to Defeat Saddam Hussein: Scenarios and Strategies for the Gulf War* (New York, NY: Warner Books, 1991).

¹⁵*Ibid.*, 50-51 and 185-207.

¹⁶US Army Command and General Staff College, *ST 100-9 The Command Estimate* (Fort Leavenworth, KS: USACGSC, 1989), page 3-3.

¹⁷*ST 100-9 Techniques and Procedures for Tactical Decisionmaking*, page 3-2.

¹⁸Epstein, 21-25.

¹⁹*Ibid.*, 4-13.

²⁰Dupuy, *Numbers, Predictions & War*, 205-207.

²¹Dupuy, *How to Defeat Saddam Hussein*, 122-126.

²²*Ibid.*, 156-170.

²³US Army Concepts Analysis Agency, *Weapon Effectiveness Indices/Weighted Unit Values (WEI/WUV)* (Bethesda, MD: US Army Concepts Analysis Agency, 1974).

²⁴Elaine Simmons, "Description of DEF Methodology," unpublished briefing memorandum, nd.

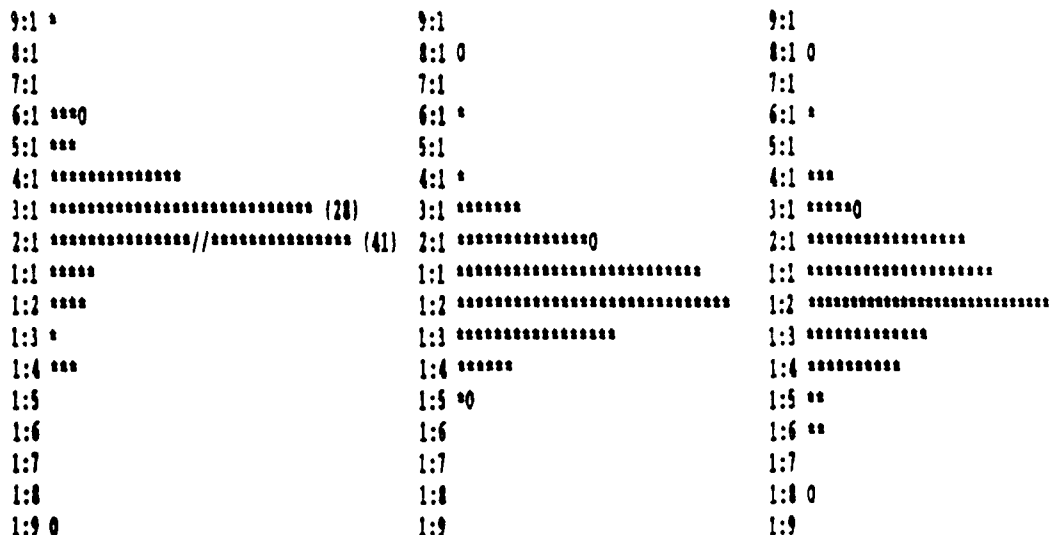
²⁵ *Ibid.* Tanks, for example, were divided into three generations: "old" (*WEI* = .85); "current" (*WEI* = 1.00); and "new" (*WEI* = 1.25).

²⁶ See the Mearsheimer and Epstein sources already cited; additionally, see William P. Mako, *US Ground Forces and the Defense of Central Europe* (Washington, DC: The Brookings Institution, 1983).

²⁷ Dwight Raymond, *Terrain-Dependent Division Equivalents: A Methodology for Calculating Strengths of Land Forces* (unpublished master's thesis for the University of Maryland School of Public Affairs, 1987).

²⁸ The "Delphi technique" is a method to "quantify the unquantifiable" It bases its measurements upon a survey of of subject matter experts who are asked to estimate such measurements. For example, a sample of experts might be asked "What are the chances of a nuclear war before the year 2000?"

²⁹ Raymond, 15-16 and 19. Since the survey generated 127 histograms, these will not be reproduced here. The following histograms, however, are representative of the patterns that appeared (pages D-1 through D-10 and F-1 through F-5):



IFVs:Tanks
(Rolling)
2.49 IFVs = 1 Tank

IFVs:Tanks
(Forested)
1 IFV = 1.48 Tanks

IFVs:Tanks
(Mountainous)
1 IFV = 1.61 Tanks

* = 1 Count

0 = Chronic Outlier (based upon pattern of responses--removed from data base)

³⁰ *Ibid.*, 21. The category weights in the OSD/University of Maryland study used 59.5 as the baseline value for a tank in rolling terrain, to be consistent with the WEI/WUV category weights. In this study, 10.00 is used; consequently, while the relative values of the different category weights are the same, the absolute values when comparing the two sets are different.

³¹ *ST 100-9 Techniques and Procedures for Tactical Decisionmaking*, page 4-1.

³² These methods are not to be confused with the "avenue-in-depth," "belt," and "box" techniques described in *ST 100-9*, pages 4-2 and 4-3.

³³ See, for example, Eric Goldberg, *Kursk Rules of Play* (New York, NY: Simulations Publications, Inc., 1980), instructions for SPI's *Kursk* war game.

³⁴ See note 6.

³⁵ See, for example, Chapter 2 "Combat Service Support Planning and Consumption Data" in Command and General Staff College, *ST 101-6 G-4 Battle Book* (Fort Leavenworth, KS: USACGSC, 1991), pages 2-1 and 2-5. This source contains the following attrition rates:

PERCENT LOSSES OF EQUIPMENT AND PERSONNEL

	DEFENSE		OFFENSE		DELAY/COV FORCE		OUT OF CONTACT
	<u>1st day</u>	<u>sec/day</u>	<u>1st day</u>	<u>sec/day</u>	<u>1st day</u>	<u>sec/day</u>	<u>each day</u>
Tank	20	25	25	25	25	25	5
APC	20	15	25	20	20	20	5
155mm How	10	10	10	10	10	10	5
203mm How	10	10	10	10	10	10	5
Atk Hel	30	25	30	25	30	25	5
Division Troops	3.5	1.9	6.6	3.5	2.5/1.2*	-	1.0
Corps Troops	.7	.6	.8	.7	1.1/-	-	-

*Use a loss rate of 17.4% for the actual units in the covering force

³⁶ *ST 100-9 Techniques and Procedures for Tactical Decisionmaking*, page 3-3.

³⁷ Organizational data used to calculate the figures in this section were obtained primarily from Command and General Staff College, *ST 100-3 Battle Book* (Fort Leavenworth, KS: USACGSC, 1991) and *ST 101-1 Organizational and Tactical Reference Data for the Army in the Field* (1987).

³⁸Organizational data used in this section are based primarily upon US Army, *FM 100-2-3 The Soviet Army: Troops, Organization, and Equipment* (Washington, DC: Department of the Army, 1991). Supplemental information was taken from: Combined Arms Command, "Soviet Army Restructuring Update," *CAC Threats Update*, vol. 2, no. 2 (28 August 1991): 11-16; Command and General Staff College, *ST 100-7 Soviet Army Handbook* (Fort Leavenworth, KS: USACGSC, 1991); letter, Combined Arms Command Threats Director to Commander, 177th Armored Brigade (6 September 1991); and David C. Isby, *Weapons and Tactics of the Soviet Army*, second edition (London: Jane's Publishing Company, Limited, 1988).

³⁹"Soviet Army Restructuring Update," 11-16.

⁴⁰*Ibid.*

⁴¹*Ibid.*, 15.

⁴²Information on the composition of Soviet artillery groups is taken from US Army, *FM 100-2-1 The Soviet Army: Operations and Tactics*, initial coordinating draft (Fort Monroe, VA: HQ TRADOC, 1989), page 9-6.

⁴³*ST 100-7 Soviet Army Handbook*, page FS-11.

⁴⁴*FM 100-2-3 The Soviet Army: Troops, Organization, and Equipment*, page 4-116.

⁴⁵"Soviet Army Restructuring Update," 15.

⁴⁶MRB mortar batteries are being reduced from eight to six mortars. "Soviet Army Restructuring Update," 15.

⁴⁷Organizational data used in this section are based primarily upon The S-2, 177th Armored Brigade, *NTC Handbook 100-91 The Iraqi Army: Organization and Tactics* (Fort Irwin, CA: National Training Center, 1991) and upon Frank Chadwick, *Desert Shield Fact Book* (Bloomington, IL: Game Designer's Workshop, 1991).

⁴⁸Organizational data used in this section are from Battle Command Training Program, *North Korean Peoples Army Order of Battle* (Fort Leavenworth, KS: USABCTP, 1991).

⁴⁹Corps organization is as follows (*Ibid.*):

Infantry Corps: 4 Inf Div; 1 Truck-mobile Div; 1 Ar Bde; 1 Lt Inf Bde; 1 Sniper Bde; 1 Arty Bde; 1 Rkt Lchr Bde.
Reserve Corps: 5 RNTV Div; 1 Ar Bde; 1 Arty Bde; 1 Rkt Lchr Bde.
Armor Corps: 4 Ar Bdes; 1 Arty Bde.
Mech Inf Corps: 6 Mech Bdes; 1 Arty Bde.

⁵⁰Division structures are as follows (*Ibid.*):

Infantry Division: 3 Inf Regts: 1 Arty Regt: 1 Mtr Regt: 1 Tk Bn: 1 AT Bn: 1 Lt Inf Bn: 1 Recon Co.

Inf Div (Trk-mobile): Same, but with no Lt Inf Bn.

Infantry Division (Reserve): 3 Regts: 1 Arty Regt: 1 AT Bn: 1 Recon Co.

Rocket Launcher Division: 3 Rkt Lchr Bns (total 108 BM-24s, 216 BM-21s).

⁵¹The figures in this section are based upon organizational data in David C. Isby and Charles Kamps, Jr., *Armies of NATO's Central Front* (London: Jane's Publishing Company Limited, 1985), 245-258 and Chadwick, 22.

⁵²Isby and Kamps, 250.

⁵³Chadwick, 22.

⁵⁴Figures based upon Isby and Kamps, 118-130.

⁵⁵*Ibid.*, 182-192.

⁵⁶I am indebted to Lieutenant Colonel Cho Chung Kun and Major Jang Kyung Wook for providing the organizational data used to develop the figures in this section.

⁵⁷The Weapon Values (WV) used in these tables are the author's estimates based primarily upon the original Concepts Analysis Agency (WEI/WUV) study. This study, eventually declassified, was periodically updated; the latest of these, however, remain classified and, in any event, the updates are no longer published by CAA. For the WV's assigned to newer weapons systems, the author's estimates were based upon: an analysis of the capabilities of these systems; the Operational Lethality Indices Dupuy's *How to Defeat Saddam Hussein*, pages 156-170; and the judgements of the author as well as other Army officers. Users of this study in classified settings may wish to obtain one of the cancelled CAA *Weapons Effectiveness Indices/Weighted Unit Values (WEI/WUV) Updates*.

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